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TEACHER'S MANUAL

Part II.

FOR

PRANG'S COMPLETE COURSE

IN

FORM-STUDY AND DRAWING

Books III and IV.

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TEACHER'S MANUAL

Part II.

FOR

PRANG'S COMPLETE COURSE

IN

FORM-STUDY AND DRAWING

Books III. and IV.

BY

JOHN S. CLARK, MARY DANA HICKS
WALTER S. PERRY

THE PRANG EDUCATIONAL COMPANY
BOSTON NEW YORK CHICAGO

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MARCH 17, 19

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AUTHORS' PREFACE.

THIS course of instruction presents, not Form Study alone, not Drawing alone, but Form Study and Drawing as complementing each other, as together furnishing a means of mental development second to no other study, and indispensable in the education of every child, as leading to a knowledge and appreciation of the beautiful.

FORM STUDY AND DRAWING IN MENTAL DEVELOPMENT.

Recognizing that the development of the mental powers in their natural order, leading to thought, requires not only perception, but also expression, the authors have arranged the work of this Course so that pupils shall first observe and study the forms of models and objects, and shall then express by drawing what they have observed in the forms of the models and objects studied. By the presentation of models of type forms, supplemented by familiar objects, the senses are addressed, the attention is awakened, the powers of observation are incited, the mind is stirred to action, thought ensues. Drawing is then introduced, not simply as a means of training the eye and hand, but as a language by which the pupil not only expresses but impresses his thought. Still further, in the "making" required in the study of the models and objects, the ability to use the hands is trained and encouraged, the creative faculties are developed, and thus manual training, with all its healthful influences, is begun. Pupils going through this Course will not only be led, through the cultivation of their observing powers, to take a lively interest in the forms of objects around them, but will also become conscious of the power of expressing their ideas of such forms by drawing, whether with regard to their facts as

seen in working-drawings, to their appearance as seen in pictures, or to their decoration; at the same time, while the eye has been trained to observe, and the hand to draw, the mind has been constantly unfolding through perception, thought, and expression.

ART EDUCATION.

Still further, it is a distinct aim in this Course to lead pupils to an appreciation and love of the beautiful as found in Nature and as expressed in the hand-work of man. What man has done, what he has created, is Art. It is the belief of the authors that Art Education, or the study and the creation of the beautiful, should be begun with the earliest instruction of children; that while Nature is studied with reference to the facts to be observed, there is yet a truth, a beauty of Nature that transcends all particular or material manifestations; and that this truth or beauty is seen only when these particular manifestations, as embodied in form and color, are observed in their relations to the plan, the harmony, the unity that exist throughout Nature.

DRAWING IN CONNECTION WITH OTHER STUDIES.

It is the hope also of the authors that the work in this Course may lead teachers and pupils to a free use of Drawing as an aid in other studies; and that through the constant connection, both in the Manual and in the Drawing-Books, between type forms and objects familiar to all, teachers and pupils may learn to look upon Drawing, not as subsisting in and for itself alone, but as a very important and ready means of awakening and conveying thought in the other subjects of the school curriculum. Drawing should be as much at the command of every teacher and every pupil as writing and speaking, and should be as freely used.

It is hoped, therefore, that teachers will seek every opportunity to carry the drawing out in broad applications in other studies, and will encourage pupils to use it as a means of expression generally in their school work.

VALUABLE SUGGESTIONS.

The authors desire to acknowledge their obligations for valuable suggestions to Mrs. Hannah J. Carter, Director of the Art Department,

Drexel Institute, Philadelphia; Miss Josephine C. Locke, Supervisor of Drawing, Chicago; Prof. W. S. Goodnough, Supervisor of Drawing, Brooklyn, N. Y.; Miss Katherine E. Shattuck, Normal Class, Art Department, Pratt Institute, Brooklyn, N. Y.; Miss Ada M. Laughlin, Supervisor of Drawing, St. Paul, Minn.; Miss Sara A. Fawcett, Supervisor of Drawing, Newark, N. J.; Mrs. T. E. Riley, Supervisor of Drawing, St. Louis, Mo.

JOHN S. CLARK.
MARY DANA HICKS.
WALTER S. PERRY.

JANUARY 10, 1893.

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PLAN OF THE SERIES.

THIS series comprises ten Drawing-Books, accompanied by five Manuals, Parts I.–V., which cover the work of the ten books. Each book contains, —

REGULAR DRAWING EXERCISES. OPTIONAL PAGES.

In connection with this work, preliminary practice is to be given by drill exercises, which, while taking but little time, are of the greatest importance in producing freedom of movement and confidence on the part of the pupil.

"Making," in connection with Form-Study and Drawing, is also of great importance. The Prang Pattern Sheets have been prepared to accompany the Drawing-Books of this Course, and are furnished with the books. Upon these sheets patterns are printed for the pupils to cut out and fold to make familiar forms. In these exercises a beginning is made in manual training. The forms thus made are to be used as objects of study and as models for drawing.

NATURE OF THE WORK.

The exercises require, —

DRAWING FROM MODELS AND OBJECTS.
FROM DICTATION.
FROM WELL-CHOSEN COPIES.
FROM MEMORY.
ORIGINAL DESIGN.
MAKING MODELS AND OBJECTS.

Throughout the series the work is based upon the study of models, familiar objects, and natural forms. From the first, pupils learn to draw from real objects and not from copies of objects. As the sense of touch

furnishes one of the readiest means of ascertaining the form of an object, the lessons are so planned as to require handling of the models and objects by the pupils.

The work is strictly educational, — it deals with the mind; through the study of concrete objects thoughts are awakened which the hand and eye are trained to express. The imagination is cultivated, the sense of beauty is developed, and the expression of artistic ideas follows.

The models of type forms used in the first two primary years are studied by way of review, and ideas of form thus presented are expressed by drawing. More thoughtful work is now required in drawing, and the manner of presenting the work is adapted to the ability of the children using each book. Additional models and new objects are taken as the work advances.

CHARACTER OF LINE IN DRAWING.

Particular attention is requested to the character of the lines in the drawing-books. They have the softness and quality of pencil lines. They furnish to pupils models of the lines desired from them, — lines showing freedom of movement, ready handling, and varying expression. Such lines require a soft pencil, — one not harder than an M grade.

VALUE OF COPYING GOOD EXAMPLES.

It is desirable in this work not only that pupils should learn to express their own ideas of form, light and shade, grouping, etc., but that they should learn *good methods* of expression. They should also learn as much as possible of the elements of beauty from the best types of historic ornament. To these ends, exercises in copying good examples are made a part of the work.

GENERAL DIRECTIONS.

In acquiring a knowledge of Form, there are three stages: Perception, Thought, Expression. Observation of Form requires both Perception and Thought. Expression of Form must of necessity be preceded by Observation. These general directions will therefore be classed under the two heads: Observation of Form and Expression of Form.

OBSERVATION OF FORM.

MODELS AND OBJECTS.

The term form will be used in this manual as including three dimensions, while figure or shape will be used as referring to only two dimensions. Both form and shape should be observed first in concrete objects. Hence the exercises in this series of books are based on the use of models and objects. The models are of the simple type forms, and are in both teacher's and pupils' sizes.

For the complete list see description at the end of the book.* The objects chosen are based on type forms, and are such as can be procured with very little trouble.

Every drawing exercise should begin with observation of the models or objects by the pupils. The directions under this head in each exercise are given to indicate to the teacher the manner in which the pupils should be led to observe (that is, to perceive and to think about) the form of models and objects.

Technical terms, which must be given by the teacher, should always **follow,** *not* precede, the observation of the form or figure to which the term applies.

JUDGMENT OF SIZE AND PROPORTION.

The ability to judge correctly of size and proportion is of great importance, and should be carefully cultivated throughout all form study. An inch (generally expressed 1″) should be made the standard at first, later a foot (generally expressed 1′ 0″) may be introduced, and dimensions may be given in feet and inches. The teacher should in some way intro-

* Where it is practicable, it will be of great advantage to have the pupils well supplied with models, so that each pupil may observe the model for himself through the hand by handling, placing, moving, etc., as well as by the eye.

duce into every exercise, whether from an object or from a copy, questions leading to judgment of definite length in inches, and also to judgment of the proportion of models, objects, and figures, by the consideration of the *relative* length of edges, of diameters, of profiles, and of lines.

DEVELOPMENT OF IMAGINATION.

The value of the imagination in all conditions of life is too often forgotten. The teacher should have in mind constantly the development of the imagination. In studying a model, thought should be led from the model to its mental image, from that to its likeness in common objects, thence on to the possible action and uses of the model. Then in expressing the thought about the model by drawing, the imagination will again come in play and inspire not only the simple drawing of the model, but also the consideration of its various actions and modifications. Such imaginative work should be encouraged, but it should also be controlled.

EXPRESSION OF FORM.

VALUE AND METHOD.

Expression of form is doubly valuable, — on the one hand to the pupil, as a means of completing the study of the form; on the other hand to the teacher, as showing to what degree the pupil has received the idea of a form. There are three ways by which ideas of form can be expressed: by Making, by Drawing, by Language.

MAKING.

Pupils can express their ideas of the form of a model or object most *completely* by making the model or object; therefore, throughout this series, frequent exercises are given in making objects as a part of the regular work. Modeling in clay is an admirable means of expression, and is not difficult as a class exercise. Directions for the management of clay can be found in "The Use of Models," and in the Primary Manuals, Parts I. and II., published by The Prang Educational Company. Teachers should encourage children in making simple objects in clay, paper, cloth, cardboard, wood, etc.

CUTTING.

This exercise has been successfully introduced into many schools. Its object is, that children may learn to observe figures, not lines; that they may learn by doing; to give skill in using something besides a pencil; when colored paper is used, to aid in the study of color; to open new lines of thought; to create interest, — in short, more fully to educate the child. In some of the exercises it is directed that figures or designs cut from paper be pasted upon the page of the Drawing-Book. This gives variety to the work. To carry it out, the teacher has simply to pass about the room with a mucilage-brush and touch each book in one place, near the centre of the space the figure or design is to occupy; the pupil will then lay the design upon the page and press it down. In no case should a design or a piece of paper be pasted all over the back.

DRAWING.

Training in position, pencil-holding, movement, and drawing, as indicated in the following directions, must be systematically pursued.

Freedom of Movement. — The importance of freedom of movement in drawing cannot be overestimated. It produces lightness of touch, quickness in execution, begets confidence in one's ability to draw, and when acquired by a class of pupils, materially lessens the work of the teacher. Experience among thousands of pupils shows conclusively that too much stress cannot be laid on the necessity for the early development of freedom of movement. The ability to sketch rapidly and easily an illustration of a thought awakened in the mind, cannot be attained without it.

A set of drawing-books, finished as draughtsmen would finish them rarely indicates the best teaching. It is of far more importance that the child should have opportunity to work first for freedom of movement rather than for straightness of line.

Position. — The children should sit on the left half of the seat facing the desk They should sit erect, feet flat on the floor, the eyes never nearer the paper than is necessary for a clear view of the lines. They should not bend forward unnecessarily, and should learn to work at a distance.

Book. — The book should be directly in front of the pupil, pushed back on the desk, the long edges parallel to the long edges of the desk. NEVER TURN THE BOOK. To guard against undue rubbing or offsetting of the lines, and also to protect the page from any moisture of the hand, pupils should use a piece of cotton cloth the size of the page. While neatness in work should always be insisted on, bold freehand work should never be sacrificed for immaculate pages in the books.

Pencil. — The pencil should be of medium grade (The Prang School Pencil M is the proper grade) for all freehand work. It should be sharpened to a round but quite blunt point, and used for drawing only. When the pencil is worn away it should be lengthened by a pencil-holder. Short pencils should not be used.

The pencil should be held lightly *three* or *four inches* from the point, so that it will have the support of the middle finger and be held by the thumb and forefinger. Pencil-holding should be practiced by itself before beginning to draw.

Pencil. — The pencil should always be held at right angles to the line to be drawn when drawing straight lines, and at an angle of about 30° to the paper.

Fig. 1.

Fig. 2.

Fig. 3.

Fig. 4.

Drawing. — Vertical lines should be drawn from top to bottom; horizontal lines from left to right; oblique lines, as a rule, from top to bottom.

Lines at the left and top should be drawn first, as a rule, though all parallel lines should be drawn in succession when practicable.

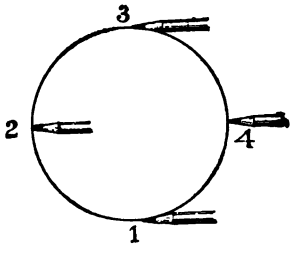


Fig. 5.

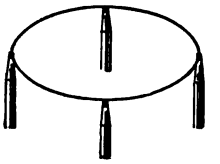


Fig. 6.

Circles and vertical ellipses should be drawn from the lower end of the imaginary vertical diameter, holding the pencil from left to right all the time. In drawing horizontal ellipses the pencil should be held as for a horizontal line. Circles, ellipses, and ovals should be sketched with one sweep of the pencil.

Lines should be drawn continuously, without stopping or retracing.

All curved lines, no matter how short, should be practiced over the printed copy before drawing.

Erasing. — All figures should be sketched with free movement without the use of the eraser. Pupils should erase together as a class, and should not be allowed to use the eraser when lining-in.

Blackboard. — Every opportunity possible for blackboard work should be given to the pupils.

COLOR.

The use of color in the study of form will be found of great value. Color exercises are therefore suggested for each book. A general statement of principles and methods will be found on pages 86, 98–103. A fuller statement of principles and methods, together with a regular course of study in color and specific exercises, with many illustrations, will be found in "Suggestions for Instruction in Color."*

* Published by The Prang Educational Company.

SUGGESTIONS TO TEACHERS

FOR

THE USE OF THE MANUAL.

THE text for each exercise is divided into three parts, and each part has its special purpose. For the purpose of clear distinction each part is presented in a particular size of type.

For information with regard to the subject and the special topic of the exercise, the matter in large type should be studied. It will be noted that at the close of this part of the text, the special points to be developed with the class are given.

For suggestive methods of developing in the minds of the pupils the ideas of the exercise, the matter in smaller type headed "Study of Models by Pupils" and "Observation Exercise by Pupils" should be studied.

For definite statements as to the drawing to be done, the matter headed "Practice" and "Direction" should be studied.

It is earnestly hoped that teachers will not look upon the manual text either in its Suggestions or its Directions as something to be rigidly followed, but that they will strive to learn and apply the method and spirit of the work in the instruction of their classes. The attention of teachers is especially called to pages 3, 4, and 36, regarding the method and spirit of this work.

NOTE. — As pupils now receive in the first two years of school good instruction in Form-Study and Drawing, guide points and some illustrative diagrams necessary in the early edition of Drawing-Books I. to VI. are omitted in the later edition. It will be necessary, therefore, for teachers to make the slight adaptation in the instructions in the Manuals for the various exercises which is needed to meet the changed conditions. The drill exercises and practice pages, given in the Manuals as preceding the regular exercises, are to be drawn upon practice paper by pupils using the later edition.

BOOK III.

In Books I. and II. the exercises relate to the study of the facts, appearance, and decoration of form, but without specified arrangement under these three divisions. In Book III. and succeeding books the exercises are arranged specifically under the three heads, *Construction*, *Representation*, and *Decoration*; and the exercises given under these three heads lead to Working-Drawings and Constructive Design, to Pictorial Drawing and Composition, to the Drawing of Ornament and Decorative Design.

CONSTRUCTION. ***Facts of Form.***	**SOLIDS: Cylinder, Square Prism, Vase Form.** **TABLETS: Circle, Square.** **MAKING: Cylindric Box, Square Box.**
REPRESENTATION. ***Appearance of Form.***	**CYLINDER, TUMBLER, FRUIT, COVERED BOX.** **COMPOSITION: Groups of Fruit.**
DECORATION. ***Ornamentation of Form.***	**ROSETTES; MOORISH ORNAMENT.** **DECORATIVE DESIGN: Surface Covering, Modification of Units, Ornament from Natural Form.**

Drawing.

Language. — (See page 76.)

Color. — (See pages 72–75.)

INTRODUCTION.

The Three Subject Divisions of Form Study and Drawing.

THE study of Form and Drawing includes three distinct yet correlated subjects: —

CONSTRUCTION, the science and art of making diagrams or working-drawings, which give the facts of objects, and from which objects may be constructed.

REPRESENTATION, the science and art of delineating or representing objects as they appear to the eye.

DECORATION, the science and art of producing beauty in ornament.

These subjects require the study of objects and examples, and drawing is used as a means of expressing ideas gained by such study.

It frequently happens that instruction in drawing is confined to one or perhaps two of these subjects.

Pupils are sometimes given only the study of the *facts* of form; such pupils become, through this one-sided study, almost insensible to the *appearance* of form, and remain wholly uncultivated in the recognition and appreciation of beauty in form and ornament.

In other cases, pupils are given only the study of the *appearance* of objects, without any foundational knowledge of the *facts* of form; they are left completely ignorant of the broad uses of drawing in industry, and know nothing of the elements of beauty in ornament.

In still other cases, the instruction in drawing tends wholly to decorative design, leaving out of consideration entirely the study of objects either as to their facts or their appearance.

Considerable instruction is sometimes given in the principles of these subjects without making adequate provision for the proper expression by the pupils of these ideas. For want of suitable copies in the three subjects, pupils are left almost wholly to their own devices with regard to suitable rendering by drawing, each subject requiring different treatment.

Any course of drawing, therefore, which does not give well-balanced and closely connected instruction in the three subjects, Construction, Representation, Decoration, which does not also lead to the appreciation of beautiful form in each of the three subjects, and which does not provide suitable examples of "rendering" as well as of historic ornament, can produce only very imperfect and one-sided results.

In Books I. and II. these three subjects are equally developed, the exercises having been planned with special reference to Construction, Representation, and Decoration. In Book III. and succeeding books the exercises are designated as belonging respectively to Construction, Representation, or Decoration, and the exercises in the latter part of each book are devoted to a review of the three subjects. The instruction in the Manuals is arranged accordingly.

Care should be taken to have the nature of these three subjects clearly developed in the minds of the pupils; and frequent opportunity should be taken to recall and impress them. Instruction in the three subjects should be as nearly parallel as possible; it would be found a great disadvantage to pursue one of them for six months at a time to the exclusion of the other two.

Plan of the Manuals.

In preparing the Manual Text for the Drawing-Books of Prang's Complete Course, the endeavor has been to meet all conditions.

In many cases where these books will be used, the regular teachers have been prepared for the work by training and experience, and the pupils have received instruction in the first two primary years of Form Study and Drawing according to the Primary Manual called "The Use of Models." In many other cases, the regular teachers who are called on to teach these books have had no opportunity to become acquainted with the method or the subject-matter of the primary work of "The Use of Models." Again, the children may not have had the primary instruction, or may have received it only to a very limited extent.

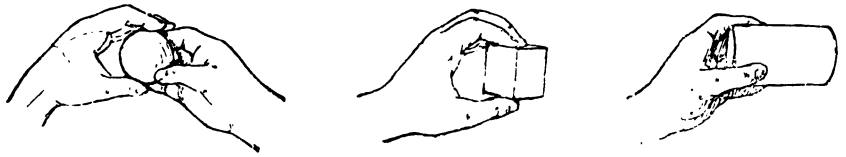
The text for these Manuals has therefore been prepared with a view to meeting the needs of both teachers and pupils who have not had previous practice or training. The text under each exercise consists of three parts, the first part relating to the subject-matter necessary for the information of the teacher; the second part relating to the method of developing these ideas in the minds of the children; the third part to specific directions for drawing. The exercises given for "Study of the Model" and for "Observation by the Pupils" are given as suggestions. It is expected that teachers will supplement and vary these exercises by their own skill and tact and through their knowledge of child-nature. If the pupils are beginners in the work, the teacher must be careful to lead the children to such observation as will enable them to discover and recognize the leading characteristics of a form or of a detail before giving the name. If pupils have been already prepared in the primary work, the earlier exercises in the Drawing-Book may be treated in part as review exercises by the teacher. A general review of the type forms used in Books I. and II. is now presented for the use of teachers who are not familiar with those books and the Manual, Part I.

Review of Models previously studied.

The characteristics of the different models are given quite fully below, so that all points, signification and use of terms, etc., may be quite clear in the mind of the teacher before beginning the work of this book. It will be well to review the pupils in a general way on previous work. The review with the pupils can be carried on rapidly, if the teacher is thoroughly prepared.

The Sphere. — The sphere is chosen as the first model for study, because it is the simplest and the best known of all type forms. It is smooth and pleasant to hold and handle, and always feels the same however you may turn it in your hand. Its outline always appears the same; for however you may turn or place the sphere, the outline is always a circle.

There are many objects like the sphere in form that are pleasantly familiar to all the pupils. Many fruits — the apple, the orange, the currant, the gooseberry, the peach, the cherry, the grape — are like the sphere in form. The playthings most preferred by children as well as by those of larger growth are like the sphere, — marbles, croquet balls, balls for bowling, footballs, tennis balls, base balls.



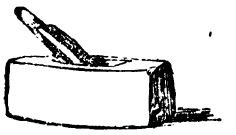
The Cube. — The second model taken is the cube, because it is the most simple type form next to the sphere. It is also the type which is the form most like and the most unlike the sphere, with which it should be compared. All knowledge is based upon comparison.

The cube is like the sphere in that it measures alike from top to bottom, from left to right, and from front to back. But the cube also differs from the sphere. The sphere is round and is therefore pleasant to hold; the cube has edges and corners and therefore, when grasped, will cut and prick the hand. The outside or **surface** of the sphere is unbroken by an edge; the surface therefore has but one part. The surface of the cube is broken by edges and thus divided into six parts. A part of a surface unbroken by an edge is called a face. The sphere then has one face; the cube has six faces. The shape of the outline of the sphere is like the outline of a circle; the shape of each face of the cube is square. We speak of the *form* of an object as including three dimensions, of *shape* when we wish to include but two dimensions. It is necessary that the teacher should be very careful in the use of these two words.

The sphere seems the symbol of motion; the cube, on the contrary, represents rest, as it stands so firmly, and does not, like the sphere, move at a very light touch.

The faces are all alike, and it can stand on any face. Therefore cubes can be placed side by side or built up so as to match and form a regular structure. Hence we find this form among the building-blocks of children.

As the cube is so compact and so regular, it is a favorite form in many ways. Lumps of sugar, caramels, etc., are like cubes in form; many boxes, baskets, hat trunks, are like cubes; kitchen stoves frequently have this general form; cubic inkstands and mantel clocks are also found.



The sphere has but one face, and this face is equally round in every direction. It is called a *round* face. The surface of the cube is divided into six faces,—the *front* face, the *back* face, the *left* face, the *right* face, the *top* face, the *bottom* face. These faces are all perfectly flat, such as would be made by a carpenter's plane. Such faces are called *plane* faces. The name of the kind of face, *plane*, and the name of the carpenter's tool, *plane*, are both taken from the same Latin word, *planus*, meaning flat.

In whatever position the sphere is held, but one half of it can be seen. How much of the cube can be seen depends upon its position in relation to the eye. It can be held so that one, two, or three faces may be seen. If held at arm's length, directly opposite the eyes with a face toward you, but one face is visible. Raise or lower the cube a little, and two faces are visible. If the cube is held opposite the eyes with an edge toward you, two faces are visible; if raised or lowered while in this position, three faces are visible. When the cube is held so that the front face can be seen squarely, the cube is said to be facing; otherwise it is said to be turned.

The visible portion of the sphere always appears, in outline, round like a circle. The visible faces of the cube do not always appear square. When more than one face is visible, they appear somewhat modified in shape. When placed so that but one face is visible, that face appears square.

The six faces of the cube are all square and equal in size. Its twelve edges are straight and equal in length. When the cube is placed upon a perfectly level surface it has four *upright* or *vertical* faces, and two *level* or *horizontal* faces. The edges forming the sides of the vertical faces are vertical edges; those bounding the horizontal faces are horizontal edges. Hence, when in this position, the cube has four vertical edges and eight horizontal edges. The vertical edges extend directly up and down. The horizontal edges extend from back to front or from left to right. Note this, as the mistake is frequently made of supposing that horizontal edges extend only from left to right. All *level* edges are *horizontal* edges.

The following résumé will bring before the teacher the points of resemblance and difference between the sphere and the cube:—

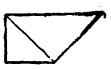
SPHERE AND CUBE COMPARED.

Type form.	**Sphere.**	**Cube.**
Nature.	Ready to move.	Ready to stand.
Outside or surface.	No edges, no corners.	Edges and corners.
Kind of surface.	Round.	Broken by edges, but wholly plane.
Parts of surface, or faces.	One face.	Six faces.
Shape of faces.	In outline like a circle.	Square.
Part visible.	Half of its face.	One, two, or three faces, according to position.

Corners.—The cube has been considered above as a whole, as to its surface, faces, and edges. A little thought should now be given to its corners. There are three kinds of corners,—**solid** corners, formed by the meeting of three or more faces (a solid corner formed by the meeting of three faces is called a **triface** corner); **biface** corners, formed by the meeting of two faces; and **face** corners, formed by the meeting of two edges. All of these are found in the cube. The triface and the biface corners may be also either outside or inside corners. The cube has only outside corners. A room or a box has inside corners.

At this time face corners only will be considered. The face of the cube naturally presents itself first, as having been already studied. Any face of the cube is a square. For the purposes of convenient study, cut a square of paper. The square has four equal straight edges and four corners, formed by the meeting of the four edges. The corners are all alike. In order to find out most quickly how to describe these corners, it will be necessary to contrast them with other corners. These can readily be produced by folding.

Folding is a kind of manual training. All work in manual training should be done with great care and accuracy. To insure accuracy, folding should always be done on the plane face of some object; never in the air. Lay the paper square on the desk with a corner toward you. Fold the nearest corner over to the furthest corner and crease. One corner of the square remains, but there are two different corners. Unfold the square. Turn the square to the right, so that the next corner will be toward you. Fold the nearest corner over to the furthest corner and crease. Unfold. Turn the paper to the right, so that an edge will be toward you. Fold the nearer edge to the further edge and crease. Fold from the corner to the middle, as shown in the illustration. There are now three different kinds of corners,



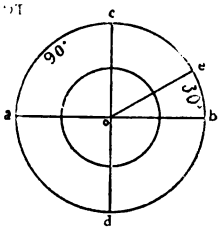
because the edges differ in their relative directions. The edges forming the two left corners meet squarely like the corners of a square, and they are therefore called **square** corners; the edges forming the upper right corner incline more toward each other and meet more sharply, and therefore it is called a **sharp** corner; the edges forming the lower right corner incline more away

from each other and meet less sharply, and therefore it is called a **blunt** corner. Many corners of each kind can be found in every school-room. Corners, then, may be classified as *square*, *sharp*, or *blunt*, according to the relative inclination of the edges or faces which make them. This relative inclination is measured by angles.

Angles. — An angle is the difference in direction of two or more faces, edges, or lines; it is therefore used as the measure of a corner. The angle made by the edges of a square corner is called a **right angle**; the angle made by the edges of a sharp corner is called an **acute** angle; and the angle made by the edges of a blunt corner is called an **obtuse** angle. In the corners of the folded square you find two right angles, one acute angle, and one obtuse angle. In every corner there is an angle, but there may be angles without corners. A corner is made by the *meeting* of two or more edges or lines. As an angle means simply the difference in direction of faces, edges, or lines, an angle is made whether the edges or lines meet or do not meet. Angles are estimated by the number of degrees of a circle which they contain. Any whole circle has 360 degrees. A degree always means the three hundred and sixtieth part of the circle, and so designates a less or greater absolute distance, according to the size of the circle. Thus a degree of the distance around the earth is about 69⅛ miles; while a degree of the distance around an orange, or a pencil, is only the fraction of an inch.

The number 360 was fixed upon to designate the degrees into which a circle should be divided, because, being the common multiple of so many numbers, but few fractions occur when it is used in making actual calculations; thus, 2, 3, 4, 5, 6, 8, 9, 10, 12, 15, 18, 20, etc., will divide 360 without a remainder.

The opening of a right angle is equal to one fourth of any circle. To illustrate: From *o*, as a centre, strike two circles. Draw two straight lines, *a b* and *c d*, perpendicular to each other. The two intersecting straight lines, which make four right angles, will divide each circle into four equal parts. Thus the opening of a right angle is equal to one fourth of a circle, large or small, and equals ninety degrees, indicated thus, 90°. While the size of a right angle is always the same, the size of an acute or an obtuse angle is always indefinite. If we wish to give the exact size of any angle except a right angle, it must be done in degrees. An acute angle is any angle less than 90°. The angle formed by the lines *o e* and *o b*, being one third of a right angle, is an acute angle of 30° (thirty degrees). An obtuse angle is any angle larger than 90°, but less than 180°. The angle formed by the lines *o a* and *o e*, being equal to one right angle and two thirds of another, is an angle of 150°.



The Hemisphere. — The hemisphere was taken next. It is readily developed from the sphere by bisecting it. A hemisphere is half of a sphere. It

should be studied by comparing it with the sphere and cube. The sphere has one face, the hemisphere has two faces. The hemisphere will stand on either face, will slide on one face, will rock on one face, but it will not roll. One face is similar to the face of the sphere, but because it is not completely round, it is called *rounding*, not round. The other face of the hemisphere is like the faces of the cube, plane. The shape of the plane face of the hemisphere is a circle.

The sphere has no edges; the cube has twelve edges. The hemisphere has one edge. The edges of the cube are straight; the edge of the hemisphere is *curved*.

The form of the hemisphere is naturally more often seen in divided objects than elsewhere, — half-fruits of various kinds; but it is also met in many manufactured objects; dishes, bowls, kettles, ladles, are frequently like a hemisphere in outline; also buttons, caps, lamp-shades. It is important that the children should be led to find the form studied in objects around them, because, on the one hand, the resemblance serves to interest them in the type form itself and to fix it in their minds; and, on the other hand, it tends to make their knowledge of form real and vital, as being a component part of all their surroundings.

The Cylinder. — The cylinder was taken next because it is also a simple and a very familiar form. It is somewhat like the sphere and somewhat like the cube. It is called by Froebel the "mediation" between the sphere and the cube. The sphere will stand and will roll. The cube will stand and will slide. The cylinder will roll and will stand and will slide. Its surface has three parts or faces; two of the faces are plane faces. The other face is curved, as it is round one way and straight one way.

The nature of both the sphere and the cube requires that they shall measure equally from front to back, from left to right, from top to bottom. The cylinder, however, is not so restricted. Its height or length may be of any proportion to its width. Thus a wire, an unsharpened lead-pencil, a rolling-pin, a street-roller, a collar-box, a coin are all cylinders, although of such different proportions. They all have three faces, — two plane, one curved. As the form of the cylinder allows of so great a variety of proportions, a simple yet pleasing proportion was chosen for the cylinder in the Prang Sets of models. This element of proportion (which is, in art, the pleasing relation of unequal parts) adds much to the beauty of the cylinder. Beauty should always be considered in the preparation or selection of materials for Form Study.

In Nature, the trunks of trees are like a cylinder; the limbs between the offshoot of one branch and that of another are like a cylinder; the branches between the twigs, the twigs between the nodes, are like a cylinder. A node is the point on a stem where a leaf starts. The cylinder is a favorite form in many ways. Handles are generally cylindric, as a cylinder can be so comfortably grasped and held; from

the handle of a baby's rattle to the handle of a crowbar, the cylinder prevails. Penholders and pencils are like cylinders. A hollow cylinder is also a favorite form for many receptacles. Music-rolls, traveling-rolls, needle-books, etc., are found in the form of a cylinder. Cans of various sorts are cylindric. Napkin-rings, umbrella stands, pails, cups, etc., are like a cylinder. Boilers, gasometers, cisterns, are like a cylinder. The form of all binding material is generally that of a cylinder, as wire, string, cord, rope. Conduits are generally of the form of a cylinder, as water, gas, and steam pipe.

The Square Prism. — The square prism is a very regular model. Like the cylinder, it has always two of its dimensions equal, and the third variable. Place the cylinder and the square prism upright. You will see that the cylinder measures the same from back to front as from left to right. The case is the same with the square prism.

The proportions of the sphere, cube, and hemisphere can never vary. The sphere and cube must each, by their form-nature, have their three dimensions equal. The hemisphere must always be in the proportion of 1 to 2. All type forms except the sphere, cube, and hemisphere may vary in proportion and yet keep their form characteristics. In planning the Prang models, it was thought best to have, as far as possible, a simple, pleasing, definite proportion between width and height throughout the models of type forms. The proportion determined for use was 1 to 2. The models of the cylinder and the square prism are therefore in the proportion of 1 to 2. It would be wrong, however, to conclude that cylinders and square prisms must be always in this proportion.

But while the two models agree in having two of their dimensions equal and the third variable, they differ in the number and shape of faces or of parts of faces visible. The cylinder has three faces, — two plane circular faces and one curved face; the square prism has six plane faces, — two square and four oblong.

The stems of some plants are somewhat like square prisms, but the form of a square prism is not common in Nature. Boxes and trunks are generally like a square prism, as its form is so well adapted to packing. The square prism is the form often chosen for horizontal and vertical supports, as the long plane face affords so good a resting-place for other timbers. Cars, omnibuses, and other vehicles frequently have the form of a square prism.

Construction. Geometric Views. — Study now the different geometric views of the cylinder. A geometric view of a model or an object is a view that is obtained when but two dimensions of a model or object are visible. A front view of a model or object is obtained when the model or object is directly opposite the eyes; a top view is obtained when the model or object is directly beneath the eyes; a bottom view is obtained by looking directly up at the model or object; a left-side

view is obtained by looking directly at the left side, and a right-side view by looking at the right side.

Hold the cylinder upright directly opposite the eyes, and you will have the front view of the upright cylinder. The front view has the outline of an oblong. If this does not seem quite clear to you, trace the outline again as directed above. Also hold the cylinder between you and the light; consider the shape of the outline only, and you will see it as an oblong. It may be a little difficult for you to get the front view of the cylinder, as it is perhaps somewhat different from your previous thought of the cylinder; but the children will not find it difficult. Hold the upright cylinder at the waist, look down upon it; you will see the top view, a circle.

Hold the cylinder horizontal from left to right, — the left-end view is a circle; the front view is an oblong. Look directly down upon the cylinder; the top view is also an oblong.

The front view of the vertical square prism is an oblong, and the top view is a square.

Representation. Appearance of Cylinder. Square Prism. — It is important that the study of the models should not be one-sided and devoted wholly to facts and views. The cylinder should be studied not only as to the shape of its faces and geometric views, but also as to other aspects. Turn the cylinder in many directions; however you turn it, you can see not more than one plane face and half of the curved face. Hold it upright and sufficiently below the eye to have the top face in sight. You will see that the top face does not look like a circle, which it really is, but like an ellipse, which it appears to be. Hold it upright and sufficiently above the eye to have the bottom face in sight. You will observe again that the circular face appears like an ellipse.

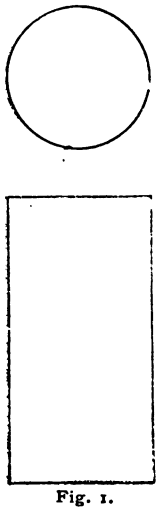


Fig. 1.

Fig. 2.

A similar study of the part visible, and of the appearance of the circular faces when seen obliquely, should be given to the children. The truth of the facts and the truth of the appearance should receive equal attention, so that one shall not obscure the other in the mind of the pupil. Fig. 1 shows the top and front views of the cylinder; Fig. 2, its appearance when placed a little distance below the eye.

Place the square prism vertical, with the top on a level with the eye. Lower it somewhat and observe the appearance of the top face; you see that the top face does not appear as wide from back to front as it does from left to right. You see also that

the further edge does not look as long as the nearer one, and that the left and right edges appear to run toward each other. Place the model horizontal, (1) long faces extending from back to front, (2) from left to right; and observe it in the same way. Lead pupils to observe their models in the same way. Be sure to make clear to them, however, that this is the study of the appearance of the model, while the geometric views give the facts of its form.

Drill Exercises.

Practice Paper. — It is desirable that pupils should have some practice in movement and drawing before beginning work in the Drawing-Book. For this purpose, use sheets of manila practice paper, six by nine inches.* This paper will be found useful for practice previous to many of the exercises throughout the Drawing-Book, as well as for folding. The sheets should be used on both sides for drawing. Provision should be made for from twenty-five to thirty sheets for each pupil for use with one Drawing-Book.

Drill Exercises Necessary. — In order to draw well, two things are necessary, — a knowledge of the thing to be drawn, and skill of hand to draw. Study, then, not only the object to be drawn, but endeavor also to attain skill of hand through repeated practice.

It is not enough that the mind wills the hand; the muscles must be trained to obey. Hence frequent drill exercises are given to afford practice for proper pencil-holding, free movement, and ready drawing. The teacher should seek to become ready in drawing, and should carry out the exercises given to the pupils.

The first exercises chosen are simply in movement directly *from top to bottom*, *from left to right*, and also *round and round*. The first steps preparatory to these exercises are very simple; but they are essential to success, and should therefore be practiced with great faithfulness.

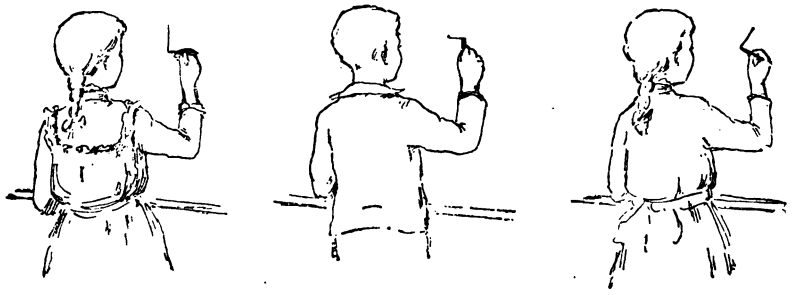
Books and Pencils. — The name of the owner should be carefully written upon each Drawing-Book before the time of the lesson. The books should be placed in piles arranged according to the rows of pupils, to be ready for distribution when desired. The pencils should be sharpened to a blunt point, so that a broad line may be obtained. If the pencils have sharp points, they will make thin, hard, wiry lines, instead of the broad, soft, gray lines which are so much more pleasing.

Pencil-holding. — Before beginning work on the paper, give practice in pencil-holding. Let a monitor for each row place a pencil in the groove of each desk in the row, taking care to have each pencil point toward the left. Then give exercises as follows in taking up the pencil and in holding it properly: Hold

* The paper is put up in packages of one hundred sheets, and may be obtained of booksellers and of The Prang Educational Company.

up the left hand; take your pencil near the point with the thumb and first two fingers of the left hand; place the pencil between the thumb and first two fingers of the right hand, letting these grasp the pencil lightly near the middle. Thus the pencil will be quickly placed in the hand, and long pencil-holding will be insured. It will be well to have pupils lay down and take up their pencils together three or four times, so that the manner of doing may be well understood.

Movement for Straight Lines. — Free work both in movement and in drawing is of the greatest importance; for drawing, to be valuable, must be free and ready. Give practice in movement with the pencil from back to front on the desk, and see that *each pupil* holds the pencil at an angle of about 30° to the desk, and pointing directly to the left (see Fig. 1, page xii); the same for movement from left to right, the pencil at an angle of about 30°, and pointing toward the back of the desk (see Fig. 2, page xii); and from corner to corner (see Figs. 3 and 4, page xii). To keep the children together, for movement count as follows: One, back; two, back; three, back. Endeavor to make the whole movement continuous, unbroken; therefore count in even time.

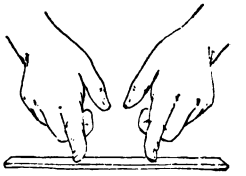


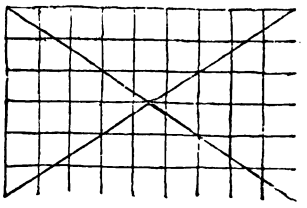
These illustrations show drawing at the board, with the crayon held properly with relation to the line to be drawn.

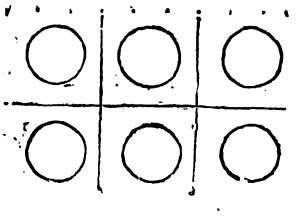
Practice. — The practice paper may now be distributed, and the paper placed in front of the pupil, with long edges from left to right. Each pupil may place a point that shall be an inch from the upper edge and from the left edge. Beginning at this point, lines an inch apart, and ending an inch from the lower edge, may be drawn down the paper at the count of the teacher, movement being practiced first. When counting for movement for straight lines and drawing combined, count as follows: One, back; two, back; three, ready; draw. The movement may be made as many times as seems desirable, — generally not less than two nor more than five times before drawing, — but the word for the last movement back should be *ready*, that pupils may be prepared to draw. Beginning at the

first point, lines an inch apart, and ending an inch from the right edge of the paper, may be drawn across the paper at the count of the teacher, movement being practiced first. Beginning at the first point again, a line may be drawn in a similar way to the lower left corner; and beginning at the upper right corner, a line may be drawn to the lower left corner.

Movement for Circles. — Give directions for holding the pencil for movement round and round with the pencil pointing toward the left, as if for drawing a vertical line and for practicing the movement on the desk (see Fig. 5, page xiii). The pencil must be held the same throughout the movement. Count, One, two, three, four, etc., counting but *one* for each circular movement. For the last complete movement before drawing, say *ready*. The counting will then be, One two, three, ready, draw. After practicing the movement on the desk, the paper may be taken; pupils may bisect the left edge and trisect the upper edge, using the fingers, as shown in the illustration, or a finger and a pencil. From the points of trisection, verticals may be drawn down the paper, and from the point of bisection, a horizontal may be drawn across the paper at the count of the teacher. In each space a circle may be drawn at the count of the teacher, special attention being given to pencil-holding and to free movement. Illustrations of these two exercises are given below.







Quality of Line. — It is desirable that the line in this work should be, as a rule, broad, soft, and gray, instead of thin, wiry, and black. The texture should be open and transparent. To secure this, the line should be made with light pressure, using rather a soft pencil having a broad face (*not* a point to the lead). There will then be little spaces between the particles of lead which make the line, giving it openness and transparency.

Length of Exercise. — As the purpose of the drill exercises is to give practice in free movement and ready drawing, it would be a great mistake to make these exercises long. No drill exercise should occupy ten minutes, and the best results in the end will be reached if not more than five minutes are spent. The children will soon become anxious to produce good work in the shortest space of time.

Order of Class Work.

I. Form Study by Pupils.
II. Position of Book, of Class.
III. Pencil-Holding.
IV. Drawing of Construction Lines. — Class Exercise.
V. Drawing Outlines. Individual Exercise.
VI. Use of Eraser.
VII. Finishing the Drawing.

Details of Work.

I. In Construction and in Representation, teachers lead pupils to study models or objects; in Decoration, to study arrangement and examples of ornament.
II. Pupils place their books with long edges parallel to the front of the desk, but pushed well back; they take pencils and positions for drawing the construction lines, sitting upright.
III. They hold pencils long and place them at right angles to the line to be drawn.
IV. They draw all construction lines continuously, without stopping and at the word of the teacher; one line being drawn, all lines parallel to that line are next drawn. Light work. No testing, no erasing.
V. The outlines desired are then drawn, each pupil moving and drawing by himself.
VI. Pencils are then placed on the desk, the eraser is taken for the first time and used in erasing superfluous and incorrect lines.
VII. The eraser having been used, it is put aside and pencils again taken to finish the work.

There are some exercises in which all these details will not be found applicable, but they show the general plan to be pursued.

CHAPTER I.

CONSTRUCTION;

Or, Drawing as Applied in Conveying Ideas of the Facts of Objects.

Of the three subjects, **Construction, Representation,** and **Decoration,** *Construction* is the one upon which the others should be built. It deals with the facts of form, and shows the use which is made of the drawing of these facts, in the world of industry. Its importance, both educationally and practically, cannot be too strongly emphasized.

Construction is the science and art of making drawings which give the facts of objects and from which objects may be constructed. These are called working-drawings, and are necessary to guide the workman in nearly every branch of manufacture.

In Books I. and II. the facts of form of models and objects, as shown in various views, are studied as a means of gaining a complete knowledge of type forms and as leading to observation of form in general. The study of the facts of form is continued in the succeeding books; and the study is further developed, so that pupils will be able to read working-drawings and to make them from objects, and also to make working-drawings of objects not yet constructed. Constructive design receives attention, and beauty of form is constantly considered.

A Working-Drawing. — A working-drawing is a drawing which gives all the facts of form, size, and structure of an object. Its purpose is to show a workman with accuracy all the facts of an object which is to be made. This object may be one already made or it may exist only in the brain of the inventor or designer.

A working-drawing is, therefore, composed of as many different geometric views of an object as are necessary to the complete understanding of the object.

A **geometric view** shows an object under the simplest possible conditions; that is, as seen with but two dimensions. For such a view, the object is supposed to be placed directly in front of the eye in such a way that two dimensions only are visible; for example, a cube may be presented in such a way that the front face alone — a square — is seen with its two dimensions, height and width.

The different views required in a working-drawing are named from the part represented in the view; thus the front view represents the view obtained by looking directly at the front of the object; the top view represents the view obtained by looking directly down upon the object; and so on with the other views.

It has been agreed by long custom to represent certain things in working-drawings by certain kinds of lines; agreements of this sort have come to be known as "conventions." The "conventions" of construction to be noted at this time are few. The various kinds of lines used are centre lines, working lines, visible lines, invisible lines.

In lead-pencil drawing, the centre line — that is, the line for placing the views — is usually made a short-and-long-dash line - —— - —— - —, the long dashes being made longer than those for "invisible lines." Working lines, by means of which distances are transferred from one view to another, are frequently made short-dash lines, but they may be made light lines. Working lines, however, are used only in elementary practice. All visible edges — that is, edges which are actually seen in the view to be drawn — are represented by clear, full lines, called "visible lines," perfectly even and uniform, not too strong nor yet too fine.

"Invisible lines," representing edges which are known to exist in the object, but which cannot be seen in the particular view which is being drawn, are always made long-dash lines — — — — —, and should be of the same strength as the full lines. By means of these conventions, the purpose of these various lines is seen at a glance.

It is necessary to multiply the views as the details of the object increase, and as the construction becomes more complicated; but it is not often in simple objects that more than three outside views are required. Yet there are six outside views of any rectangular object: top view; bottom view; front view, sometimes called upright view or face view; back view; left-side, or end view; right-side, or end view. In addition to these, there may be as many sectional views as are required for a clear understanding of the internal construction and details. A sectional view is a representation of an object, which gives two dimensions and details of the object, as seen when it is cut through horizontally or vertically, thus showing the construction of the interior.

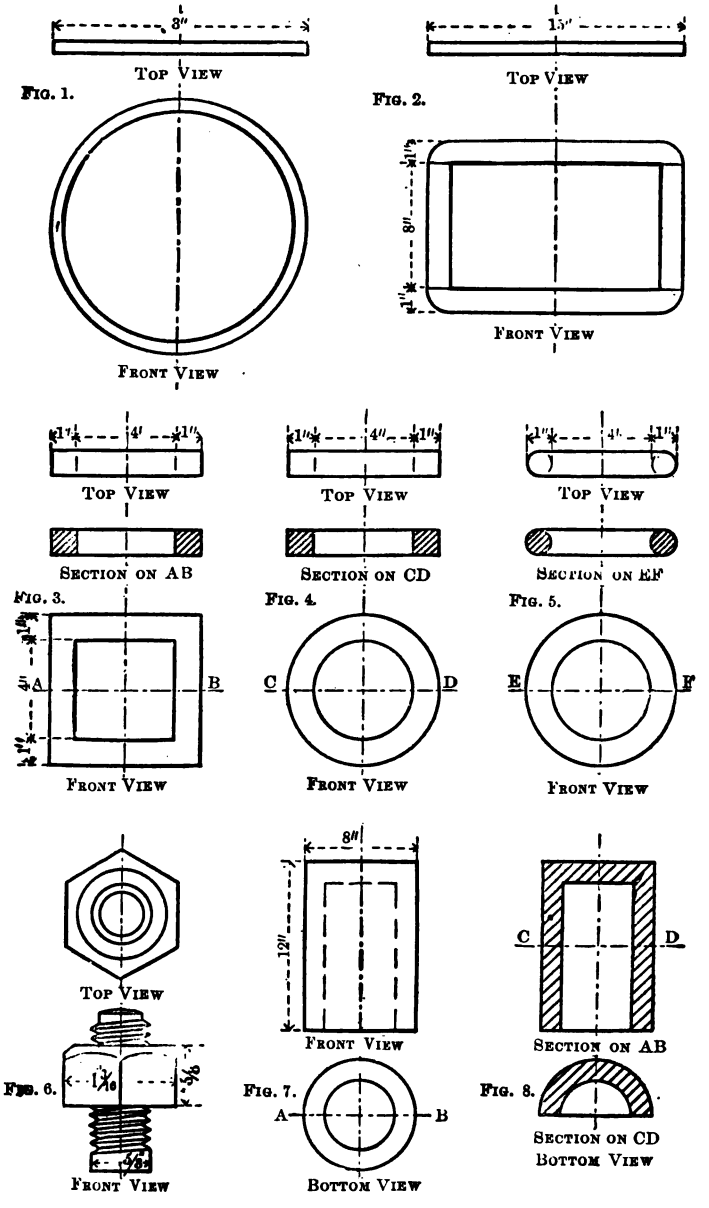
Illustrations of working-drawings of simple objects will be found on page 17. Fig. 1 shows two views of a hoop; Fig. 2, two views of a slate; Fig. 3, three views of a square frame, square in section; Fig. 4, three views of a circular frame, square in section; Fig. 5, three views of a circular frame, circular in section; Fig. 6, two views of a screw; Fig. 7, four views of a hollow cylinder, closed at the upper end. It will be seen that in Figs. 3, 4, 5, and 7, sectional views are necessary to show the facts of form of the objects.

The "conventions" mentioned above — centre lines, visible lines, invisible lines — are illustrated in these working-drawings. Working lines are illustrated on page 20. It will be noticed that these drawings give the facts of size as well as of form.

Dimensions. — Clear ideas of dimension are necessary in the subject of construction.

Dimension is extent in any one direction.

Dimension in only one direction, as of a line, is known as length.


8″
TOP VIEW
FIG. 1.
FRONT VIEW
15″
TOP VIEW
FIG. 2.
8″
FRONT VIEW
1½″ 4″ 1″
TOP VIEW
SECTION ON AB
FIG. 3.
A
B
FRONT VIEW
1″ 4″ 1″
TOP VIEW
SECTION ON CD
FIG. 4.
C
D
FRONT VIEW
1″ 4″ 1″
TOP VIEW
SECTION ON EF
FIG. 5.
E
F
FRONT VIEW
TOP VIEW
FIG. 6.
1 3/16
5/16
5/8
FRONT VIEW
8″
12″
FRONT VIEW
FIG. 7.
A
B
BOTTOM VIEW
C
D
SECTION ON AB
FIG. 8.
SECTION ON CD
BOTTOM VIEW

When there are two dimensions, as of any surface, the two dimensions are called length and breadth.

When there are three dimensions, as of a solid, the longest dimension is known as length, the next is known as breadth, and the shortest is known as thickness. Thickness, however, always expresses solidity, and is never used to express the third dimension of a hollow object.

The terms just spoken of are applied to solids and objects without reference to position.

Let a solid now be considered with regard to both dimension and position. It has three dimensions, as before, but the dimensions now have definite direction, — it has one vertical dimension and two horizontal dimensions. The vertical dimension is known as height; and the horizontal dimensions are designated by width: 1, width from left to right; 2, width from back to front.

When the vertical dimension is less than the shorter of the horizontal dimensions, it is sometimes known as thickness. It is better, however, as a general rule, to adhere to the terms height, width from left to right, width from back to front, in speaking of objects placed in a definite position.

The idea of dimension (extent in any one direction) should be developed in the pupils' minds before the word "dimension" is given, and before the different designations of dimension are given.

Pupils may be called on to measure certain lines in the room, whether vertical, horizontal, or oblique, — so many inches long. Then they may measure faces, — so many inches one way, so many inches the other way. Then they may measure solids, — so many inches one way, so many inches another way, so many inches another way; thus gaining the idea of measurements in different directions, and from that the idea of extension in different directions. Some pupil may be able at this point to give the word "dimension," but it is quite possible that the teacher may find it necessary to supply the word.

Thus the ideas of height, of width from left to right, and of width from back to front, as dimensions in different directions, may be developed, and probably the pupils can be led to express these by the proper terms.

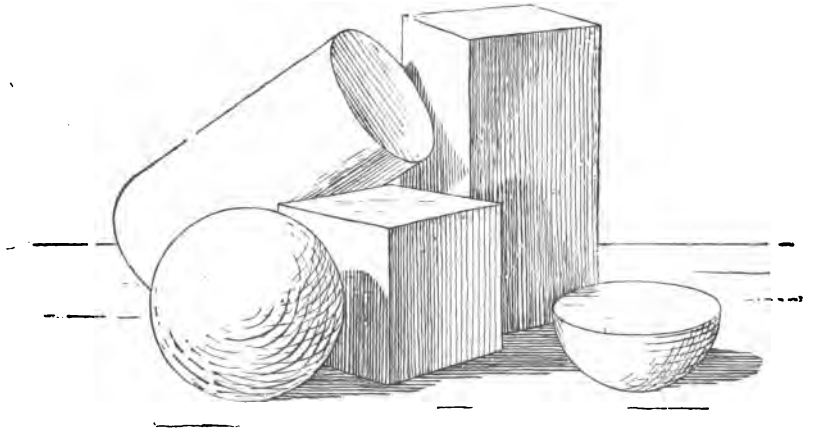
Pupils will now be ready to see that in a geometric view but two dimensions are represented, and that in order to represent three dimensions of an object two geometric views are necessary.

EXERCISE I.—Cylinder, Square Prism.—Two Views Reviewed.

MODELS: *Sphere, Cube, Cylinder, Square Prism.*

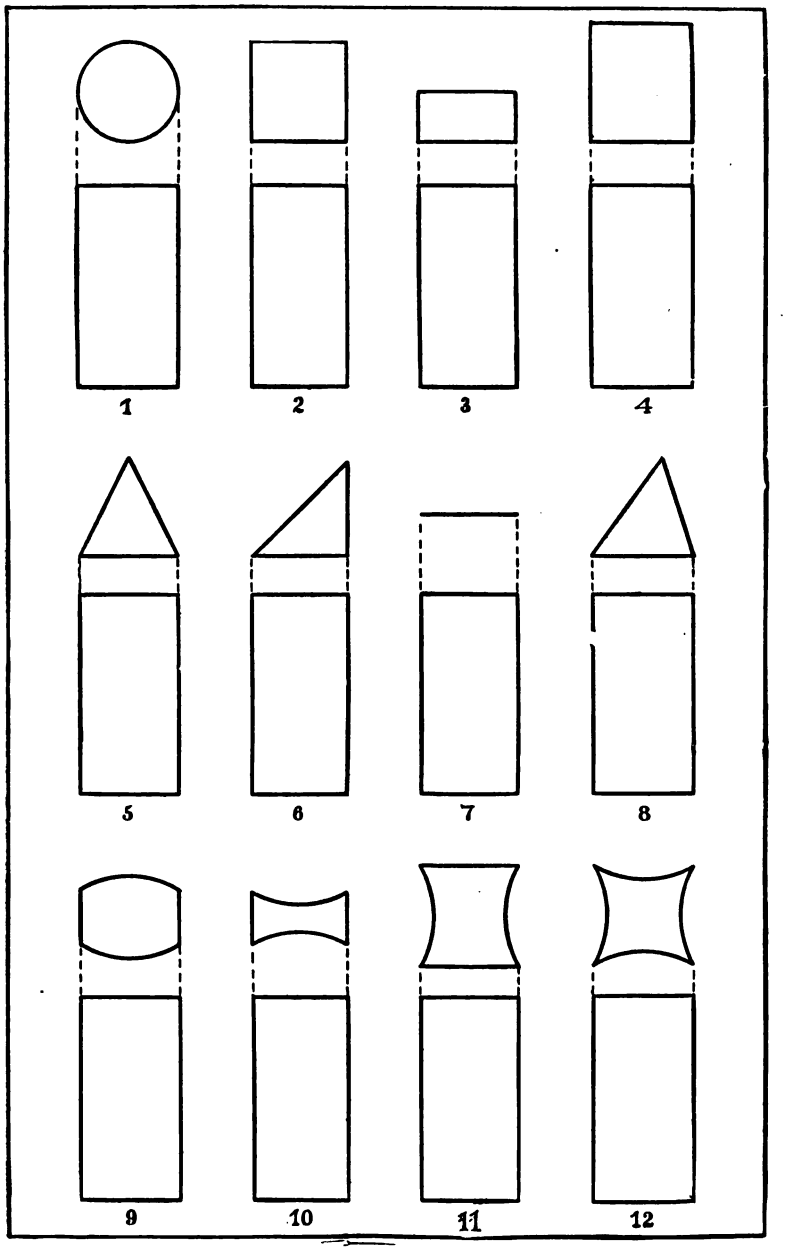
OBJECT. To recall front and end views of models.

Review.—In beginning a new book, a review should always be given for the benefit of both teacher and pupil. To the teacher, a review shows where the pupil stands, and upon what particular points in the instruction stress should be laid; it enables the teacher to find out what is "the known" to the pupil, and thus to proceed to "the unknown." To the pupil, the review recalls what may have become vague, and places him on a firm basis for the work to come. A drill exercise has already been given, reviewing pupils in position, pencil-holding, movement, and drawing. It will be well now to have a review of the sphere, cube, and cylinder, hemisphere, and square prism. The teacher will find all the help necessary for this review on pages 4–11.



Working or Transferring Lines.—In drawing the different views of objects in the previous books, the views have been placed in their proper relative positions. There was no definite reference to the subject of Construction, however, and hence no reference to any of the special "conventions" of construction. It is desirable now to make use of some of these "conventions" which are part of the language of draughtsmen.

Working-lines or transferring lines, by means of which distances are transferred from one view to another, are used a great deal in elementary practice. Formerly these working-lines were all made by dashed lines; but of late years the feeling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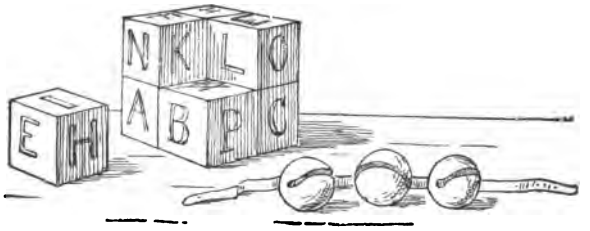
is growing that the dashed lines are a waste of time, as light lines answer the same purpose. One view having been drawn, as the front view of the horizontal cylinder in this exercise, light, indefinite lines are drawn from the upper and lower right corners to the right, so as to carry or transfer the height of the front view to the place where the end view is to be drawn. Thus the height of the end view is easily obtained.

The illustration on page 20 shows the use of working-lines, which are here dashed to show the practice of some draughtsmen; it also shows the necessity of having more than one view of an object to know its complete form. If only the front view were shown, the solid might be any one of those given; but as soon as the top view is shown, the drawing gives all the views needed, provided the top and bottom of the solid are alike; if they are not alike, a third view will be necessary.

To be reviewed. — **Sphere, cube, cylinder, hemisphere, square prism; surface, faces; kind of faces, — round, plane, curved, rounding; faces or parts of faces visible.**

To be developed. — **Horizontal cylinder, vertical square prism; front and end views; quality of lines.**

Suggestions for Review of Models by Pupils. — Grasp the sphere in one hand, the cube in the other. Which do you like to feel best? Why? What kind of surface has the sphere? (*The sphere has a round surface.*) What kind of surface has the cube? (*Its surface is wholly plane.*) How many faces has the sphere? (*The sphere has one face.*) How many faces has the cube? What kind of a face has the sphere? (*The sphere has a round face.*) What kind of faces has the cube? (*The cube has plane faces.*) What is the shape of the outline of the sphere? What is the shape of the face of a cube? How much of the sphere can you see? (*I can see only one half of the sphere.*) How many faces of the cube can you see? (*I can see one face; I can see two faces; I can see three faces.*) What can you say about the edges and corners of each model? What can you see or think of like a sphere? What can you see or think of like a cube?



Roll the sphere; roll the cylinder. What is the difference between them? (*The sphere rolls all ways; the cylinder rolls only back and forth.*) Pass your fingers around

the sphere; around and along the cylinder. What do you notice? (*The sphere is round every way; the cylinder is round one way and straight one way.*) What can you tell of the surface of the cylinder? (*Its surface is partly curved and partly plane.*) How many faces has it? (*It has three faces.*) What kind of faces has it? (*It has one curved face and two plane faces.*) How many and what kind of edges has it? (*It has two curved edges.*) How many faces can you see without turning it? (*I can see one face; I can see half of its curved face; I can see one plane face and one half of the curved face.*) Hold it vertical, below the eye; how does the top face look? What can you think of like a cylinder?

Take the hemisphere; what can you tell about its surface? (*It is partly rounding and partly plane.*) How many and what kind of faces has the hemisphere? (*It has two, — one rounding and one plane.*) How many edges? What can you think of that is like it? How many faces can you see without turning it? (*I can see one plane face; I can see one half of its rounding face; I can see a plane face and part of the rounding face.*) How does the plane face look?

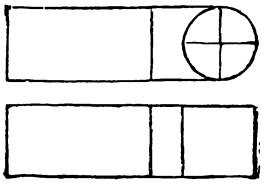
Take the cylinder in one hand and the square prism in the other; who can tell me all about the square prism? What can you think of like the square prism?

What is a vertical cylinder? (*A vertical cylinder is a cylinder standing on one of its plane faces.*) What would you draw for its top view? (*I would draw a circle.*) What would you draw for its front view? (*I would draw an oblong.*) What is a horizontal cylinder? (*A horizontal cylinder is a cylinder lying on its curved face, — 1, from front to back; 2, from left to right; 3, turned at an angle.*) What would you draw for the front view of a horizontal cylinder, lying from left to right? (*I would draw an oblong.*) What would you draw for the end view? (*I would draw a circle.*) Observe in the same way a horizontal square prism, lying from left to right.

Drawing-Book, *page 2.* — Drawing two views of Cylinder and Square Prism.

Observation Exercises for Pupils. — What figure is printed on page 2? (*An oblong is printed on page 2.*) What is it to represent? (*It is to represent the front view of a cylinder horizontal from left to right.*) Where would you draw the right-end view of the cylinder? (*I would draw it directly at the right.*) What else is to be drawn on this page?

Drawing-Book, *page 1.* — Drill Exercise. See page 13, second illustration.



Drawing-Book, page 2, completed.

Directions, page 2. — The front view of a cylinder, horizontal from left to right, is given. Draw the end view. Continue lightly the horizontals of the front view. Notice the point given for the centre of the end view; practice movement and draw the circle. Finish it with a gray line, leaving the transferring lines light.

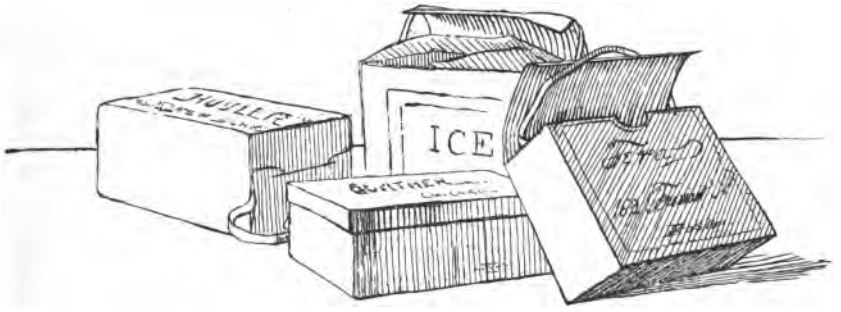
Draw the front and right-end views of a horizontal square prism of the same dimensions as the cylinder, lying from left to right. Where should these views be placed to make the page look well? First draw light horizontals across the page, then verticals, for the front and end views. Finish the views in gray lines, leaving the transferring lines light.

EXERCISE II. — Boxes. — Two Views Reviewed.

MODELS: ***Cylinder, Square Prism, Boxes made by Pupils.***

OBJECT. **To recall top and front views by objects made by the pupils.**

Boxes. — The variety that can be found in paper boxes is very great. They are made for carrying and protecting light articles, and are adapted in form and manufacture to the special purpose for which they are intended. There are folding boxes which may be packed flat when not in use; there are boxes with folding covers; there are boxes with covers to lift off. Some of these covers are made to fit over the lower part; in others, the lower part is "necked," so that the cover rests on the lower part, and the box is said to be "shouldered." There are also boxes with the upper and lower faces projecting. They are made of all grades of stock, from fine light weight to heavy manila for the folding boxes, and from rough straw-board to junk-board. They are plain, unfinished, finished with paper bindings, or elaborately covered and decorated.



A box like a cube with a folding cover was given in Book I.; a box like a square prism, with a folding cover, was suggested in Book II. Boxes with covers to lift off, and thus requiring two or more patterns, are studied in this exercise.

Patterns. — Almost all of the articles by which we are surrounded are made from patterns. Clothing, house draperies, furniture coverings, etc., all these are made from patterns. A pattern is anything cut or drawn or formed, to be used as a guide in making an object and serving to determine its exact form and dimensions. Patterns are of two kinds, flat and solid. Flat patterns are used for making articles of cloth and other textile fabrics, as dresses, coats, curtains, bags, etc. They are also used by workers in leather and other thin materials, for cutting out work, as sheet tin or iron, for dippers, basins, etc., and for making boxes and other articles of pasteboard.

Solid patterns are used for making the molds for casting metals. Car wheels, iron ware, cannon balls, stoves — in fact, most of our machinery — are cast in iron from molds made from patterns. The commoner kind of glassware is made in molds, and for these molds also a pattern is needed.

Cylindric Box. — In this exercise two boxes, one cylindric and the other square, are needed as models. The pattern from which a cylindric box can be made is not difficult. The lower part has two pieces, — the bottom and the side; the cover has two pieces, — the top and the rim. The pieces for the cover must be a very little larger than those for the box, to allow the cover to fit over the lower part. In box factories, where they have all the necessary tools for work, the bottom and side of the lower part, as well as the top and rim of the cover, are held together by narrow strips of tough paper, overlapping both pieces. Small laps cut as part of the bottom and top serve very well, however, to join these parts to the side and the rim. In this case the box is to be half as high as its width. The pattern will consist of four pieces, — two circles with laps, and two strips enough longer than the outline or circumference of the top and bottom to lap and paste well.

Square Box. — A box having its upper and lower faces square is called a square box. For the purposes of this exercise, the square box must be as wide and as high as the cylindric box. It is to have a folding cover, therefore the pattern will be in one piece. This piece must include the square top and three narrow oblongs for the cover, and the square bottom and four oblongs for the lower part, all properly adjoining and cut with laps for pasting to hold them together. Think how the faces are situated with regard to each other, and how they would be arranged if the box and cover were opened out flat.

Work out the patterns, draw them, and make two boxes from the patterns before giving them to the class. By doing this, you will be able to give every step intelligently and clearly.

Pattern Sheets. — Prang's Pattern Sheets Nos. 5 and 6 accompany this exercise. Upon these sheets are printed the patterns of a cylindric and a square box, which are to be cut out, folded, and pasted, to make the two boxes needed as models for this exercise. Before this is done, however, pupils should be asked to draw the patterns for these boxes upon the board, for the sake of the thought developed through drawing them. After the lesson the teacher should collect the boxes made for this exercise, and preserve them to be used as models for future exercises. The cylindric box will be needed for Exercise XV. in this book: and both the boxes will be needed for the next book.

To be developed. — Boxes; patterns; cylindric box, square box; front views alike, top views different; quality of lines.

Suggestions for Study by Pupils. — I would like to have patterns for two boxes. Each of these boxes is to be half as high as wide. One of these boxes is circular at top and bottom, and has a curved face between. Can any one tell what model it is like? (*The box is like a cylinder.*) What kind of a box could you call it? (*I could call it a cylinder box.*) Yes; or, better, a cylindric box. The other box has the top and bottom square and the sides oblong; what could you call it? (*I could call it a square prism box.*) That is right, but it is generally called a square box. How high were these boxes to be in proportion to their width?

The cylindric box is to have a cover that can be taken off and put on again. How many pieces must there be in the pattern? Of what shape must these pieces be? How will you make them stay together after you have made them? Draw the pattern for the cylindric box on the board.

The square box has a cover that cannot be taken off; the cover shuts down and can be lifted again; it is a folding cover, made in one piece with the box. How could you draw the pattern of this box? Think. (*I could draw a square for the bottom and an oblong on each side half as high as the square.*) What else could you do? (*Then I want the top of the cover, so I draw a square right on the side of one of the oblongs.*) And what else is wanted? (*I need the rim of the cover; I should draw, on three sides of the square, an oblong about one third as high as the oblongs for the lower part of the box.*) How will you make the box stay together?

Prang's Pattern Sheets Nos. 5 and 6. — Making the Boxes.

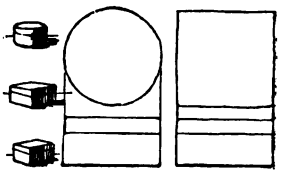
Cut out the patterns printed, fold and paste to make a cylindric and a square box. Work with great care, and strive to make the boxes beautiful by their neatness.

Studying the Models. — Take the cylindric box you have just made. What would you draw for its front view? (*I would draw for its front view an oblong half as high as wide, and about one third of the way down from the top I would draw a horizontal line for the edge of the cover.*) What would you draw for the front view of the square box? (*Why, I should have to draw just the same thing.*) If you should draw these two front views, how would any one know what they meant? (*They could not tell surely; they might guess.*) What could you do to make the meaning plain? (*I could draw the top view of each.*)

Drawing-Book, *page 3.* — Drawing views of two Boxes.

Observation Exercises by Pupils. — What is Fig. 1? What is Fig. 2? What is Fig. 3? Fig. 4 is the front view of one of these three boxes; of which do you think it the front view? Why can you not tell? What is to be drawn upon this page, and where?

Directions. — The front view of one of these boxes is given. Above it draw the top view of the circular box, moving upward from the front view and drawing lightly the working-lines downward. At the right, draw the front and top views of the square box.



Drawing-Book, p. 3, completed.

EXERCISE III.—Reversed Curves.

From a Model or Copy.

OBJECT. To study reversed curves in a vase form; to draw them.

Vase Form.—Whatever we may have to study of detail in form, it is best to study it first in some object that is real to us and that has some association that makes its presence a pleasure. Instead, therefore, of giving for this exercise abstract curves having no meaning except change in direction, and consequently no pleasant associations, the curves desired have been sought in a vase form. A vase is familiar to all, and always recalls beautiful things. Upon every teacher's desk there should be a vase. It need not be expensive, but it should be good in form, of simple outline, and modest in color. It might be called the children's vase; and they might by turns bring flowers or a spray of leaves, if nothing more (for leaves are very beautiful), regarding the vase as something for which they should care. Thus they would grow in affection for the vase and for the beauty of the flowers and the leaves.

Reversed Curves.—When a continuous curved line reverses its curvature and bends in an opposite direction, a curve is produced which is called a reversed curve. The variations of this curve are numberless; and generally the curve must be drawn with the free hand. For this reason the reversed curve is often called a hand-curve. When the use for which an object is intended permits an æsthetic treatment of its form, then the reversed curve is quite certain to be called into requisition to make that form beautiful. Again, in nearly all varieties of applied ornament, it renders conspicuous service. Hence pupils should learn the proper treatment of this curve, in order to obtain the most satisfactory results from its use. It can be so easily modified, the elements of its beauty can be so readily learned, and it can be in so many ways applied, that it usually proves a favorite line with all. It should never be drawn a part at a time, but always with continuous motion from beginning to end; otherwise its flowing character, which carries the eye with ease and pleasure, is lost. A reversed curve drawn with a continuous motion contains in itself the subtile suggestion of that motion, which cannot be produced by the most adroit imitation unless that imitation is produced by a continuous motion also.

The reversed curves given in this exercise are made up of curves of a circle; if pupils have had previous practice in "The Use of Models," practice can be given on reversed curves made up of curves of an ellipse or an oval.

Profiles.—You doubtless have studied the profile of a friend, both from life and from the shadow cast on the wall. Many possess curious little shadow pictures, or profiles, as they were called; the profile of the face and head, cut in black paper,

was laid upon white paper to bring out the delicate curvature, and the whole was framed. From these profiles we get charming imitations of face and feature and dress of another century. Many years ago much of the miniature portraiture of the time was done in that way; and so in our paper cutting of a vase, for instance, we are reviving, in another way, a serious occupation of times past.

In objects having round, curved, and rounding faces, there will be certain outlines apparent which are not caused by edges, as in a cylinder or a vase form; these are called profiles. The distant mountain against the sky shows a profile well. Try to lead the pupils to feel the beauty of curvature. In drawing the profile of a vase, care must be taken not to have any sharp angles at the lip, as they would indicate a sharp edge.

To be developed. — Vase form; profiles; reversed curves; proportion; continuous curves; beauty; quality of line.

Suggestions for Study by Pupils. — What is the figure on page 5? (*The figure is that of a vase.*) What can you say of the curves of the sides? (*They curve first one way, then another.*) Such curves are called **reversed curves**; the sides of the form are called **profiles**. What is the height of the figure? What is the width at top and bottom? What is the proportion of the width to the height? (*The proportion of the width to the height is as* 1 *to* 2.) Trace the profiles on the copy with both hands. How do you like the feeling of the motion? How does the eye pass over the curve? Can you draw the vase on the board with both hands?

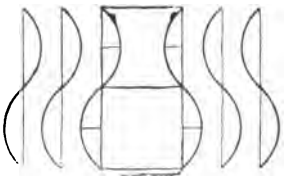
Drawing-Book, *page 5.* — Drawing Reversed Curves.

Observation Exercises by Pupils. — What is the purpose of the verticals on the vase form on page 5? (*The central line is the axis, the two outside verticals show the general proportion, and are construction lines for the profiles.*) Of the short horizontals? (*They show the altitude of the curves.*) Is the vase sharp at the lip?

Drawing-Book, *page 4.* — Drill Exercise.

Practice. — Draw a vertical downward from each point given. Bisect each vertical. Practice movement over the printed copy and draw repeatedly and continuously so as to get the full motion of the curve. Practice the same movement and draw in the same way repeatedly and continuously on each vertical.

Directions, page 5. — Connect the given points by verticals. Bisect each vertical. On the verticals at the left, curves like the left profile of the vase are to be drawn; on the verticals at the right, curves like the right profile of the vase. Trace the movement for each curve on the printed copy, and try to feel the pleasantness of its curvature; then over the printed vertical; then draw the curve with unbroken motion.



Drawing-Book, page 5, completed.

EXERCISE IV. — Bowl.

OBJECT. To study the purpose of a bowl, and also the several forms of bowls; to draw a bowl of a pleasing form, and suited to its purpose.

The Bowl. — In early times, as is sometimes the case now, the hand was used for a drinking-cup. Gourds and cocoanut shells were used to store and carry liquids. When the people discovered that clay could be fashioned and then burned to hold their liquids, they made rude forms. Doubtless their first cups and bowls were modeled from the hollow hand, the nut, the gourd, the egg. These forms are still retained, varied occasionally by the addition of a base.

Designing a Bowl. — In considering the form of any object, it is necessary to consider at the same time its purpose; for however beautiful a form may be in itself, it ceases to be beautiful if not adapted to its purpose. In designing even the most simple form, the first inquiry must be, For what is it to be used? A tumbler, for instance, should have that form which will best serve its purpose as a drinking vessel. It has been found by experience that liquid flows more readily, evenly, and pleasantly over a curved than over a rounding face; hence tumblers are made most generally with curved faces, although occasionally a seeker for novelty will produce a tumbler with rounding faces like a barrel, forgetting that by selecting this form he defeats the purpose of a tumbler.

A bowl is used more for holding liquids temporarily than for drinking or pouring; therefore its form should not be that of a tumbler or a pitcher, and it must be wider than high. On the other hand, it is desirable that a bowl shall be of such a form that it can be carried short distances without danger of spilling the contents; therefore it must not be low in proportion to its width, like a dish or a plate which are intended more for solids. Its profile may be either curved or rounding, but a bowl with profile rounding very much at the top, either in or out, is not ordinarily desirable. Rose bowls are made to round in at the top in order to keep the stems of the flowers in place.

It will be seen from what has been stated that it is not desirable to have a bowl very different from those we ordinarily see; so many experiments have been made, that about the best form has been reached. In giving the lesson, therefore, do not endeavor to lead the pupils to make a bowl entirely different from anything ever seen; simply lead them to draw a bowl that will serve its purpose well. You cannot make them realize what the purpose of a bowl is in any better way than by bringing up to them their own experiences with bowls. The bowls on the Drawing-Book page are not to be copied. If you try the exercise yourself, you will be better able to interest the pupils. There is a verse in Whittier's "Barefoot Boy" that might be read here.

To be developed.— Bowls; their purpose; form suited to purpose; pleasing form; placing a drawing; margin; quality of line.

Suggestions for Study of Form of Bowls as suited to their Purpose. — From what do you eat bread and milk? Are bowls usually higher than they are wide, or wider than they are high? (*They are usually wider than they are high.*) Why? Are all bowls alike? Can you draw on the board the front view of the bowl from which you eat? Can *you?* Can *you?*

(The teacher should obtain from pupils if possible as many as six drawings; some will perhaps be like the illustrations below.)

Has the bowl from which you eat a sharp edge? Did you ever see a bowl with a sharp edge? Why do not bowls have sharp edges?

Which do you like better, a bowl with straight sides or curved sides? Should it be narrow or broad at the bottom?

Find a bowl at home that you like. Make a drawing of it and bring it to school.

Drawing-Book, *page 6.* **— Drawing a Bowl.**

Observation Exercises for Pupils. — What is Fig. 1? What is Fig. 2? What is the difference between them? How do they compare in width? How do they compare in height? How do they compare in profile? What are you to do at the right? How large should you make your drawing? (*I should make my drawing large enough to fill the space properly.*) How wide should the margins be above, below, at the left, and at the right in a space of this size? (*The margin should not be less than an inch; the margins at the left and right should be equal; the upper margin may be wider than the lower, but the lower should never be wider than the upper.*)

Directions. — Draw through the middle of the space at the right an indefinite vertical downward. On this as a centre line draw the front view of a bowl, placing it well in the space. Make the drawing as large as the space will allow. How wide a margin should you have at the left and right of the drawing? Make the bowl of such a form (with either straight or curved profiles) as you think will be pleasing and suitable, — such a bowl as you would like to have.

CHAPTER II.

REPRESENTATION;

Or, Drawing as Applied in Representing the Appearance of Objects.

Representation is the science and art of delineating or representing objects as they appear to the eye. It concerns picture-making. The study of the facts of form of objects in Construction prepares the pupil for the study of the appearance of objects in Representation. Representation is the complement to Construction, and follows it legitimately.

The principles of the two subjects are, however, widely different; for Construction requires two or more *geometric* views, each from a different standpoint, while Representation requires a *picture* from a single standpoint.

Before attempting exercises in Representation with pupils, it is necessary to make plain to them from their own observation that the *appearance* of the form of an object, seen from one standpoint, may be very different from the facts of its form. The fact must be recognized that instruction in drawing the appearance of objects must relate primarily to instruction in *seeing*, and that pupils fail in drawing the appearance of objects more from inability to *see* than from inability to draw. In general all persons not trained to habits of correct *seeing* are predisposed toward drawing or representing the appearance of objects according to the idea of the facts of the form which the sense of touch has fixed in the mind. This is easily accounted for by the fact that until within a very few years it has been thought that the appearance of an object must be drawn from a knowledge of principles instead of through seeing. The drawing of the appearance was therefore postponed until pupils were ready to learn perspective. Such a postponement is now considered uneducational. Pupils are now led first to see the appearance of objects and then to state the principles which they have discovered through the seeing.

Nearly all the principles in this subject can be gained from the study of the appearance of type forms, the simplest geometric solids. These type forms may be broadly classified as—

1. Cylindric forms. 2. Rectangular forms.

But Representation of visible things is not all. The art is more truly called an expressive art,—the art of expressing conceptions,—for it enables a person to express ideas of things not really existing,—a noble thought or a beautiful idea. The power to think the thought and conceive the idea is inborn; but the power to represent it must be acquired, and generally comes only by careful training.

Why the Appearance of Objects differs from their Facts. — The appearance of an object depends on two conditions: —

1. Its position in regard to the observer; 2. Its distance from the observer.

Position affects the apparent FORM *of an object; distance affects the apparent* SIZE.

The apparent form of any object, except a perfect sphere, varies with every position in which it is placed in regard to the observer.

Hold a cube so that you can see but one face; what is the shape? Hold it so that you can see two faces; what is the outline of the cube as you see it?

The apparent size of an object decreases as its distance from the observer increases.

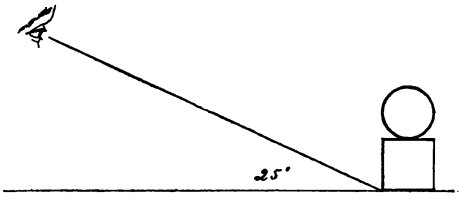
The effect of distance on the apparent size of an object is a matter of common observation. Take a vertical measurement on the pencil (see page 66) of an object at a distance of three feet, and again at a distance of ten feet.

As a preliminary to the exercises in Representation, practice can be given in measurement on the pencil, as given in the Manual text for Exercise XV., page 66. It is not intended, however, that in the early exercises the objects shall be studied by measurement on the pencil, as it is desired to lead the pupils to see approximately the appearance of objects without this aid.

The object of the Exercises in Representation in Book III. is to lead pupils to see, and to express orally and by drawing —

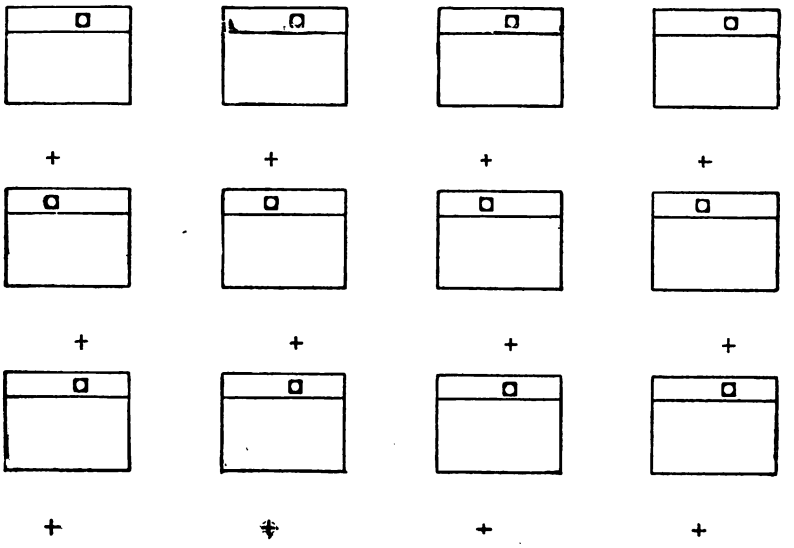
1. *That a face view of a circle is always a circle.*
2. *That an edge view of a circle is always a straight line.*
3. *That a circle seen obliquely always appears like an ellipse.*
4. *That the more obliquely the circle is seen, the more nearly the ellipse approaches a straight line.*
5. *That the less obliquely the circle is seen, the more nearly the ellipse approaches a circle.*

Placing Models for the Study of the Appearance. — The appearance will be the most pleasing if the model or group of models is placed so as to be at an angle of about 25° below the eye. If placed at a greater angle, the effort required to see it is greater. This effort to see will be reflected in any drawing of the group by a slight effect of constraint. Such an effect should be prevented by careful placing of the group.



A pupil will not be able to place a model or group upon his own desk so as to be at an angle of 25°, unless the model or group is raised in some way. But he will see the group on the desk in front of

him at about the proper angle. The following plan for seating and for placing the models is suggested. It may be found possible, under some conditions, to place the models and to seat the pupils a little farther to the right and left than indicated in the plan given.



Let the pupils sit alternately a little toward the left and the right of their respective desks, beginning by having those in front sit at the left. Let those pupils sitting at the left arrange the group on the back of the desk at the right end; let those sitting at the right arrange the group on the back of the desk at the left end. Each pupil, except those sitting in the front row, can then study and draw the group on the desk in front of his own. If possible, do not have the seats in the front row occupied. This can sometimes be accomplished by having the pupils in the front row take the seats of those who are absent. If this is not possible, let each pupil in the front row arrange a group to draw from on the desk opposite, being careful however to place the models or objects somewhat turned on the desk, so that the group may present the aspect desired.

It is important that this work should be the result of the pupils' own observation; therefore each pupil must study the object or group, and the teacher must be very careful merely to guide the seeing and not in any way to force it. Especially do not speak in any way of perspective; these are not intended as exercises in perspective, but as exercises in studying and drawing objects as they appear.

Grouping Models. — In grouping models or objects, great regard should always be paid to the pleasing or picturesque appearance of the group as a whole. In other words, they should be selected and arranged so that the general effect will be attractive whether considered as a group of models or objects, or as represented in a picture. We speak of a **combination** of models or objects when they are to be viewed or studied with regard to the facts of form; of a **group** of models or objects, when they are to be seen or studied with regard to the *appearance* of form. A *combination* of models or objects may be made for any purpose, and does not necessarily denote any special relation between the objects; a group of models or objects should always be made with reference to its pleasing effect, and therefore denotes some special relation between the models or objects which will make their appearance together attractive.

EXERCISE V.—Appearance of a Cylinder below the Level of the Eye.

MODEL: *Cylinder made by the Pupils.*

OBJECT. To make a hollow cylinder; to study its appearance below the eye; to draw the appearance.

Appearance of the Cylinder. — To those teachers who have been accustomed to consider only the facts of the form of a cylinder, who have learned to realize only that the ends of the cylinder are circles, and have never supposed that circles could **appear** different from what they **are**, it may sometimes be difficult to realize the change in appearance which the circle undergoes. It will be well, therefore, to study circles in different positions.

A good way to develop the idea of the change of appearance of a circle in different positions, so that whatever is learned will be the result of individual observation, is to cut a pasteboard circle from four to six inches in diameter, having a strongly marked centre.

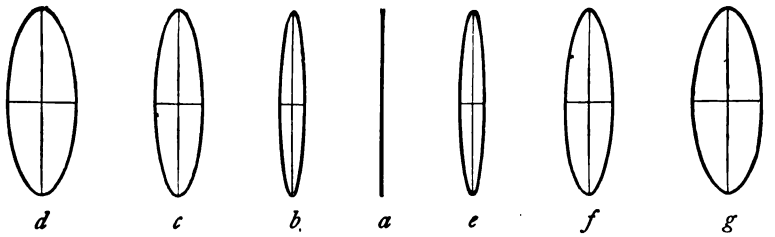
The following exercises with the circle are given for the teachers. It would not be wise at all to give them to the pupils; it is better for the pupils to study the appearance of the *whole* of the cylinder rather than to study the appearance of a part.

Hold the circle so that the face is fully visible; you have the face view. The face view of a circle is always a circle. Hold the circle so that none of its face is seen; you have its edge view. The edge view of a circle is always a straight line.

A circle is called a vertical circle when its face is vertical; it is called a horizontal circle when its face is horizontal.

In the exercises in holding the circle which are now to follow, the circle should be held sufficiently far from the eye to show a distinct outline.

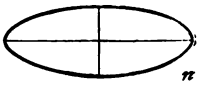
Vertical Circles. — Hold the circle now in a vertical position and opposite



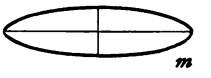
the eye, so that you have the edge view (*a*); move it slightly towards the left, still keeping the circle vertical, being careful not to turn it, and notice the change which occurs, as the face of the circle becomes visible (*b*). Compare its width from left to

right with its height; then move the circle farther toward the left and compare width and height again (*c*). It will be found that the apparent width from left to right increases as the circle is moved toward the right (as the view becomes more oblique), thus making the ellipse more and more like a circle. Hold the circle again as at *a*, and move to the right and note the results, *e*, *f*, *g*.

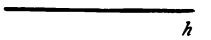
Horizontal Circles. — Hold the circle horizontally on a level with the eye. Of course the edge is all that can be seen, and the further part of the edge will be behind the near part, and the edge view will be a straight line, as at *h*, because all parts of the curve are on the same level.

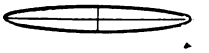


Lower the circle a little, still keeping it horizontal. The face will then appear, and the question is, what shape is seen. The face will not appear as a circle, for it can only appear so in a full face view; it will not appear as a straight line, because the whole outline is visible and is curved, and the near edge, instead of being in front of the further edge, as in the edge view, will now appear below the further edge. You now see the foreshortening of the face of the circle, — that is, the width from back to front appears less than the width from left to right. The circle in this position looks like an ellipse, as at *i*.

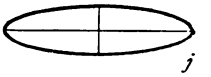


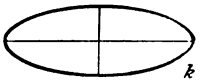
Holding the circle with the left hand, measure the two widths on the pencil (see page 65) by holding it, first, horizontally, to get the width from left to right; second, vertically, with the blunt end *down* to cover the lower curve, the thumb covering the upper curve, to get the apparent width from back to front. Decide on the proportion obtained by these measurements, and draw an ellipse of this proportion.





Again move the circle downward; its appearance in this position is also an ellipse. Measure the two apparent widths, the proportion between them, and compare the measurements with those taken when the circle was not so far below the eye. The width from left to right will appear the same as before, but the width from back to front will appear somewhat greater, as at *j*. Draw, below the ellipse already drawn, a horizontal the same length as before, crossing it with a vertical having the last-obtained proportion to the horizontal, and draw another ellipse. This will keep in mind what the pupils have found to be true.





If the circle is lowered still more, the apparent width from back to front will still increase, as at *k*. Hold the circle again as at *h* and move upward, and note the results shown at *l*, *m*, and *n*.

Review now the face view and the edge view. When you have a face view you look squarely at the face of the circle; but when you look at a horizontal circle below the eye, as in the second, third, and fourth positions, you look obliquely at the face of the circle.

The Cylinder. — After studying the appearance of the circle in different positions, cut out the pattern of the cylinder, roll and paste it. The hollow cylinder shows the appearance well. Hold the top on a level with the eye; the top appears like a straight line. Lower it a very little; this straight line seems to have expanded a little in the centre, and you can see into the cylinder. Lower it again; the opening looks larger. The appearance of the top is like an ellipse. Raise the cylinder now until the bottom is on a level with the eye; raise it higher, and you see the same changes in the appearance of the bottom that you saw before in the appearance of the top. Lower it until the bottom is on a level with the eye; lower it a little more; that part of the lower edge which is visible appears to curve down a little, and the farther you lower it below the eye the deeper the curve appears to be. The lower edge appears to curve more than the upper edge. It is plain that under some circumstances *the facts* and *the appearance* do not agree.

Making the Model by Pupils. — Prang's Pattern Sheet No. 7. Cut out the printed pattern. Roll into a cylinder, overlap the ends, and paste them together. If pupils have had previous practice in drawing the appearance of a cylinder, the pattern sheet may be overlapped more, so that the cylinder made will have a different proportion from that in the book, thus varying the exercise.

To be developed. — Facts and appearance; cylinder below the eye; top appears like an ellipse; lower edge appears like half an ellipse; lower edge curves more than upper edge; tangential union; quality of line.

Suggestions for Study of the Model by Pupils. — What is the shape of the top view of an upright cylinder? (*The shape of the top view of an upright cylinder is that of a circle.*) What is the shape of the front view? (*The shape of the front view is oblong.*) Remember that these terms, *top view*, *front view*, etc., refer always to the **facts** of an object, — to the object as it is when measured, and not to its **appearance**. The cylinder is to be studied in this exercise as it *appears*. Hold the cylinder just made at *arm's length*, vertical, with the top (1), on a level with the eye; (2), two inches below the level of the eye; (3), four inches below. Repeat.

Hold it now four inches below the eye, and look at the top; what is the shape of the top as it *appears* to you? (*It appears to have the shape of an ellipse.*) Raise the cylinder two inches; does the appearance of the top change? (*The top appears narrower from front to back.*)

Hold the cylinder vertical, at arm's length, somewhat below the eye; how much of the lower edge can you see? (*I can see one half.*) What is the appearance of the lower

edge? (*It appears to curve downward.*) Is the curve that of a circle or that of an ellipse? If you could see the whole of the appearance, what figure would it be like? Compare the front half of the upper edge and that part of the lower edge which is visible; which appears to curve the more? (*The lower part appears to curve more.*) What is the proportion of the height to the width of the cylinder?

Drawing-Book, *page 8.* — Drawing the Appearance of the Cylinder.

Observation Exercises for the Pupils. — Look carefully at the printed copy; hold your cylinder vertical at arm's length, raising or lowering it until the top appears to you like the ellipse on the printed copy; observe also the curve at the bottom. Note where the profile lines meet the ellipses; do they seem to cut the curve or to touch it? When a line meets a curved line so that it touches it, but if continued would not cut it, there is said to be a **tangential union.** Place the model on the back of the desk upon books at such a height as to give the same appearance as in the printed copy.

Drawing-Book, *page 7.* — Drill Exercise.

Practice. — Use this page for a drill exercise before drawing on page 8. Three ellipses differing in proportion are printed. Practice movement (see Fig. 6, page XIII) on the upper ellipse, moving in the order 1, 2, 3, 4. Repeat the movement half an inch to the right, and draw an ellipse with one sweep of the pencil. Repeat. Following the same order, draw two ellipses at the right of the second and third ellipse. *No erasing.*

(If practice has already been given in ellipses, draw the appearance of the cylinder on the right half of the page, studying it as above. In that case, previous to drawing the cylinder, draw ellipses between the printed ellipses, each having the width from front to back slightly greater than the one above it.)

Drawing, page 8. — Study the appearance and proportion of the cylinder on the desk in front of you. Draw the cylinder as it appears to you, in the following order: on the *printed copy* draw a central vertical, complete the lower ellipse, and draw the diameters of the ellipses.

Connect the points given at the right, for the central line of the drawing to be made. Indicate the width of the cylinder by indefinite verticals. Determine the width of the ellipses on the central line, and draw the appearance of the cylinder, finishing it in broad, even lines.

EXERCISE VI. — Appearance of Tumbler.

MODEL: *Tumbler.*

OBJECT. To study the appearance of a tumbler below the level of the eye, and to draw that appearance.

Appearance of the Tumbler. First Drawing. — This exercise requires two drawings. In the first, two circles at different distances below the eye are compared as to appearance; in the second, three circles are similarly compared. The tumblers used in this exercise should be of the kind known to dealers as "straight;" that is, having vertical profiles. The difference between the first drawing and that for the previous exercise will be mainly a difference in proportion. It will not do, however, to depend upon the study given to the cylinder; it will be necessary to study the tumbler itself. Hold it at different distances below the level of the eyes. If the tumbler is not very thick, you will be able to see the further part of the bottom through the glass, and you can compare its apparent width from back to front with that of the top. You will find that the lower ellipse appears wider from back to front than the upper.

Second Drawing. — Fill the tumbler half full of water, and hold it somewhat below the level of the eyes. You will see that the top of the water appears like an ellipse also, and that its apparent width from back to front is greater than that of the top and less than that of the bottom.

If it should not be practicable to have a tumbler for each pupil, the pasteboard circle suggested for the use of the teacher could be used by the pupils, but the exercise would not be nearly as interesting, and consequently not nearly as profitable. Be careful to have the drawings of suitable size for the spaces, leaving margins of not more than one inch.

Statements. — In these two exercises, pupils observe carefully the changes in appearance that a circle undergoes when seen obliquely and at different distances above and below the eye. In all exercises, time should be given pupils to answer thoughtfully any question before another is given. The purpose of the questions suggested would be defeated if two or three were given together, or if any answer should be given without the needed observation on the part of the pupil. The questions are intended to lead to individual observations. When these things are clearly seen by the pupils, they should be led to make definite statements concerning these changes in appearance.

To be developed. — **The face view of a circle is always a circle. The edge view of a circle is always a straight line. A circle seen obliquely always appears like an ellipse. The more obliquely a circle is seen, the more it looks like a straight line. The less obliquely a circle is seen, the more it looks like a circle.**

Suggestions for Study of the Model by Pupils. — Hold the tumbler below the level of the eye. Does the further side of the bottom appear to be above or below the nearer side? Can the further side be seen just as plainly as the nearer side? Does the further side of the top appear to be above or below the nearer? Where do the profile lines of the tumbler appear to touch the top and bottom?

Hold the tumbler with the top on a level with the eyes. Raise it a little. Can you see the further part of the top? (*I can see it through the glass.*) How does the top look? (*It looks like an ellipse.*) Raise it so that you can see the bottom of the glass a little. How does the top look? How does the bottom look? (*The bottom looks like an ellipse, but not so wide from back to front as the top.*) What is the proportion of the width of the tumbler to its height?

Fill the tumbler half full of water. Hold the top on a level with the eyes. How does the top of the tumbler look? How does the top of the water look? How does the bottom of the tumbler look? Hold the tumbler so that the bottom is on the level of the eyes. How does the bottom look? How does the top of the water look? How does the top of the tumbler look? Hold it so that the top of the water is on the level of the eyes. How does the top of the water look? How does the top of the tumbler look? How does the bottom look?

Drawing-Book, *page 9.* — **Drawing the Appearance of a Tumbler.**

Observation Exercise by Pupils. — How many drawings are to be made on this page? Where will you place them? How large will you make them? What would you draw first in each case? (*I would draw a central line, so that the drawing would not be one-sided.*)

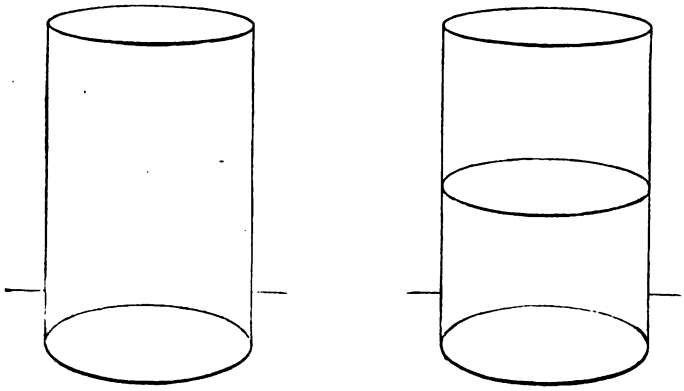
Fill the tumbler half full of water. Look directly down on the water, — vertically. What do you see? (*I see a circle.*) What view of the circle have you? (*I have a top view; I have a face view.*) What does it look like? (*It looks like a circle.*) Can you tell the whole story? (*I see a face view of a circle, and it looks like a circle.*) In what direction are you looking? (*I am looking directly down, — I am looking vertically.*)

Raise the tumbler so that the water is on a level with the eye; what view of the circle have you? (*I have an edge view of the circle.*) What does it look like? (*It looks like a straight line.*) Can you tell me the whole? (*I have an edge view of the circle, and it looks like a straight line.*) In what direction are you looking? (*I am looking horizontally.*)

Lower the tumbler. How are you looking at the circle, — the top of the water? (*I am looking at it obliquely.*) How does it look? (*It looks like an ellipse.*) Can you tell me the whole? (*I am looking at a circle obliquely, and it looks like an ellipse.*)

Hold the tumbler with the top below the level of the eyes. Look at the top of the tumbler, the top of the water, and the bottom of the tumbler. Who can tell me how they look? (*The top of the tumbler is a circle, but it looks like an ellipse; the top of the water and the bottom of the tumbler are circles, and they look like ellipses; but the farther the circles are below my eyes, the circles appear more like ellipses.*)

Can some one tell all these things as general statements without using the names? First try the face view of a circle. (*The face view of a circle is always a circle.*) Now what can you say about the edge view of a circle? (*The edge view of a circle is always a straight line.*) What can you tell of a circle seen obliquely? (*A circle seen obliquely always appears like an ellipse.*) What can you say of it, the more obliquely the circle is seen? (*The more obliquely the circle is seen, the more it looks like a straight line.*) What can you say of it, the less obliquely the circle is seen? (*The less obliquely the circle is seen, the more it looks like a circle.*)



Drawing. — Fill a tumbler half full of water. Place it somewhat below the level of the eye. Study its appearance. On the left half of the page, draw the appearance of the tumbler without drawing the water. On the right half of the page, draw the appearance of the tumbler with the water. Draw a central line before beginning each drawing. Make large drawings. Finish in soft gray lines, making the further part not quite as strong as the nearer part.

EXERCISE VII. — Natural Objects; Fruit, from the Objects.

MODELS: *Lemon, Pear.*

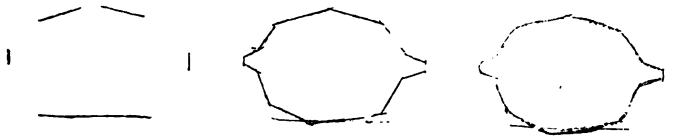
OBJECT. To study the form of a lemon and a pear, and to express it by drawing.

The Lemon. — Here is a tropical fruit almost as familiar to us as if it was from our own fruit-trees. All associations with it are pleasant, — its fragrance, its grateful acidity, its refreshing flavor, its agreeable color. As it is really a foreigner, it has also somewhat the charm of novelty. It is not perfectly regular in form, is slightly indefinite in outline, and is expressive in itself of the goodness that lies within.

The Pear. — This may be one of our own pears that has grown in our midst, juicy, luscious, at once both firm and melting. It may be perhaps a traveled pear from California, and may tell us of that sunny land. However that may be, we can enjoy its rich color, its peculiar form, and the remembrance which it brings to us of the good pears that we have eaten.

How to Draw them. — The pupils cannot as yet know much of artistic "rendering," but if the teacher can make them feel the goodness that lies in both the lemon and the pear, the pleasure that both give to the taste and to the eye, they will express in their drawing some of those things that make the fruit pleasant; and that will be a step towards artistic rendering. For artistic rendering is bringing out by drawing, painting, or modeling, with the proper recognition of the relative value of the parts, all the beauty and goodness that lie in the object drawn.

The lemon and the pear are fresh and firm because there still remains in them something of the life that made them grow while upon the tree, and that life and growth was always pushing outward. To express some of that pushing force which shows itself here and there in the form of the fruit, as well as to get the general mass of form, blocking-in lines are used.



Blocking-in. — The method of showing the general form or figure of an object by straight lines and long enclosing curves is known technically as blocking-in, and the lines used are called blocking-in lines. Blocking-in lines should be long and few in number, and should break and change direction at the most angular parts of the object. Blocking-in is of great use in two ways: first, as a means of *studying* a form; second, as an aid in *drawing* a form. As a step to blocking-in, a

pencil may be laid across the fruit at the top, at the bottom, at the left, at the right, to get the principal directions of the outline. The study of the fruit by means of the pencil, as suggested on page 43, is intended to lead to blocking-in. In blocking-in or in drawing irregular objects, it will not be advisable for the teacher to count for the pupils' movement and drawing, but the pupils must be trained to move for each line before drawing.

Quality of Line. — The wooden models are exact in form and outline; therefore, in drawing their outlines, a line even in width, while also soft and transparent, should be used. Natural objects differ from manufactured objects in substance and texture, and they have varying outlines. The outlines not only vary in direction, but they are more decided and definite in some parts than in others. This variation in direction and in definiteness is expressive of the varying forces of life and growth, and must be rendered by a similarly varying line in the drawing. The lemon, being somewhat indefinite in outline, on account of the peculiar texture of the skin, which holds its delicious fragrance, should be drawn with a line varying in thickness and not quite continuous. The skin of the pear is smoother; this will need a somewhat lighter line and more continuous throughout than the line for the lemon. Remember also that it is the general form which should be expressed and not the small details.

Table Line. — In order to show that an object is resting on something, and thus to give an effect of rest to the drawing, what is called a **table line** is added. The table line represents the further edge of the face on which the object rests. Place the lemon on a book slightly below the level of the eye and observe how high up on the outline the further edge of the book appears to be. This will help you in drawing the *table line.* In order to have the table line properly observed, the teacher must see that objects are not placed too near the further edge or too far in front of it. In the former case, the table line will appear too low and as if the object were in danger of tumbling off; in the latter case, the table line will appear too high and as if the object were placed on quite too large a face. A good general rule is to place the object so that the further edge of the table or object on which it rests will appear to be less than half way up the height of the object. The table line should usually be made a little lighter than the line of the object.

Selecting the Model. — Ask the children, in selecting any fruit, not to take those of very irregular form. Fruit that looks as if it would be good makes the best model. It will not be necessary for each to have a pear and a lemon. One pear will serve as a model for several pupils.

To be developed. — Lemon, pear; characteristic form; pleasing thoughts; blocking-in; varying lines.

Suggestions for Study of the Model by Pupils. — What have you upon your desk? (*I have a lemon.*) What is there pleasant about a lemon? Can any one tell me anything about a lemon? Is there anything that you like that is made of lemons? How do you like the color of a lemon? Do you know where it grows?

What have you on your desk? (*I have a pear on my desk.*) What can you tell me about pears? Do they taste good? Do you like to look at a pear? Why? Where do pears grow? Did you ever see any hanging on a tree? Did you ever see any of the blossoms? What color are they?

Place your pencil across the top of your lemon or your pear. Does it slant? Will you remember which way it slanted? Place it across the left side, the right side, the bottom. Could you draw the lemon or the pear with straight lines? How many would you use? Could you do it with five lines?

Put your lemon or pear back upon the desk. Look at the fruit on the desk next in front of you. Trace its outline in the air with straight lines. Do you see one side any darker than the other? Which side? If you do not see the outline exactly plain in some parts, never mind. It is because the outline is not regular, and in your drawing you may make it fainter in some parts if it looks so to you.

Drawing-Book, *page 10.* — Drawing Fruit.

Observation Exercise by Pupils. — What do you see on the page? What is the direction of the axis of the lemon? What is the direction of the axis of the pear? What are you to do upon this page? How are you going to place the drawings? Which drawing will be the wider on the page?

Directions. — Study the lemon. Decide on the space you wish it to occupy. Block-in the outline. Add the table line. Erase any of the blocking-in lines that are intrusive. Finish the lemon with a line varying as you see it, and make one part darker than another if you see it so Draw the pear in the same way.

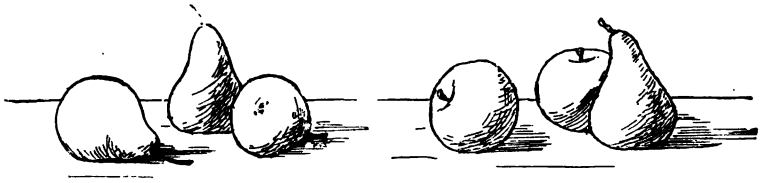
EXERCISE VIII.—Fruit, from Nature.

From Natural Fruit.

OBJECT. To arrange a group of fruit; to study its appearance; to draw its appearance.

A Group. — In Books I. and II., arrangements of two models in groups were given. An arrangement of three objects is now proposed. This exercise is an important step in pictorial composition. If a picture of a group is desired, it will not be satisfactory to place the objects at random and then draw them. Some thought must be given to the arrangement; for, if arranged in one way, the group may be very pleasing, while if arranged differently, the group may not be pleasing at all. If such arrangements are considered thoughtfully, it will be found that, in the one case, the simple principles of elementary composition have been regarded, and in the other they have been disregarded. It will be found, moreover, that these principles of composition are so simple and natural that children may be led to discover them.

Arranging a Group. — Arrange a **group** of fruit of two, or at the most three, very simple forms, so that the effect will be pleasing. Remember that the effect desired in a group is very different from the regularity allowed, and to a certain extent demanded, in decoration.

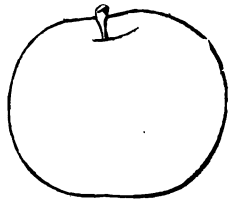


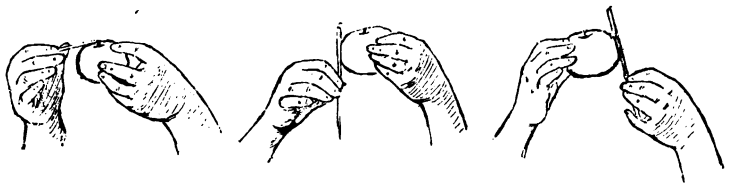
(1) Choose one for the principal object, and, generally, place it centrally but not exactly in the centre; (2), do not place the other objects in a straight line with the principal object; (3), try the effect of placing the objects so that if the centres of their bases were connected an irregular figure would be made; (4), place them as if they were good friends and belonged together, and (5), so that they will appear at rest. But remember (6) that the objects should not have the same positions, that is, their axes should not be all upright or all horizontal; they should not be parallel or at right angles to each other; and they should not present exactly the same faces; and (7) one of the objects should be partially hidden behind another, even if there are no more than two objects in the group. Look now (8) to see if in the group that you have made, the objects will appear of the same height when drawn. If so, change them, for the effect will not be pleasing. By skilful questioning, the pupils can be led to these points.

The Apple. — As apples are the easiest fruit to obtain, they will doubtless form a part of any group that the pupils may make for study.

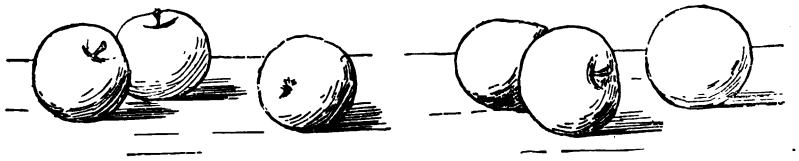
> "Pass the apples, please, again, —
> Russet, greening, snow, and pippin."

The apple was studied in Book I., but it will be well to give a little time to its further study before giving the exercise. Hold an apple at arm's length opposite the eyes, to get a front view. Notice whether the outline shows a depression at the top and bottom, and also whether the depression is slight or deep. Notice that the stem appears to start directly from the outline. Hold the apple to get a top view; notice that the stem starts from the depth of the depression and that the depression has no outline. Hold the apple slightly below the eye at arm's length; notice that the stem is seen in front of the outline of the apple and hides a little portion, as illustrated here; that the stem seems to spring from the outline of the depression, which is now visible in front, but which becomes indefinite at either side. The outline should also be studied.





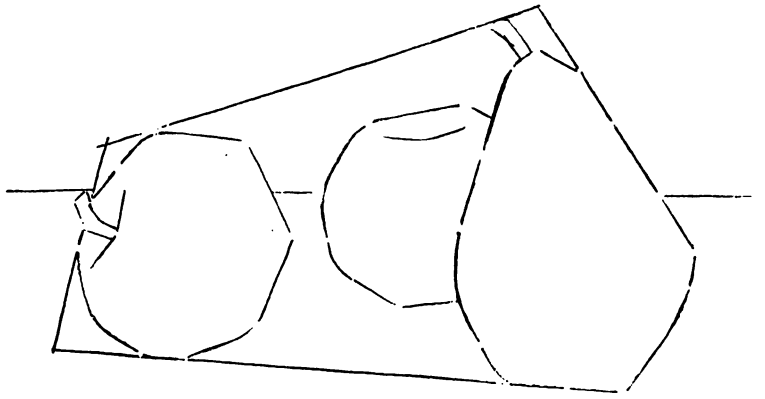
Place a pencil on the sphere (the pencil touches at but one point). Place a pencil across the top of the apple; notice where it touches and whether it slants; observe the bottom and the sides in a similar way. Having thus studied the apple, draw it by blocking-in lines.



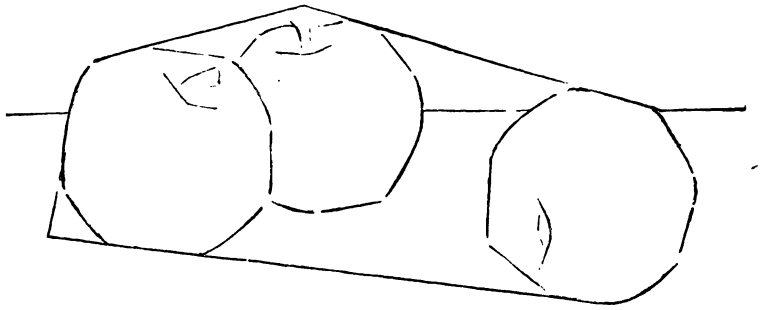
Very pleasing groups may be made of apples only, if other fruit cannot be readily obtained. The apples may be placed in a great variety of positions: the stem may show, the blossom may show, the axes may be inclined in various directions.

Blocking-in the Group. — Having studied the apple and the pear, which are likely to be component parts of the group, attention should be given to the group

as a whole. Study the proportion of the width to the height, and block-in the whole group; then block-in each fruit. The blocking-in as a first stage will prove a great help in drawing the group.



The blocking-in of the groups illustrated in the Drawing-Book is here given as an aid to the teacher. The groups given in the Drawing-Book are only suggestions and are not to be used as copies.



To be developed. — **Row, group; place of principal object; objects not in a line; objects suited to each other; objects at rest; not all in same position; not all wholly visible; not of same height.**

Suggestions for Arrangement of a Group by Pupils. — Let three pupils stand in a *row;* let three others stand in a group. What is the difference between the row and the group?

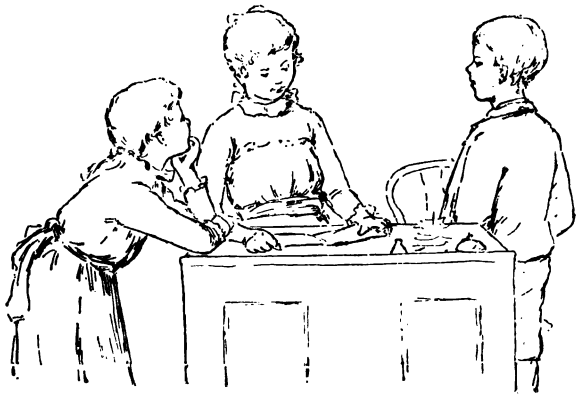
Place these three pears in a very straight, regular row; what can you tell about them? (*The pears are all in a straight line; they are at equal distances from each other; they stand up straight.*) What can you tell about their axes? (*Their axes are all very nearly*

vertical.) Do they make a nice row? (*Not quite, because they are not quite even themselves.*) How can you arrange them to look better? (*I would mix them up a little and place them something as though they were clustered together.*) How would they stand? (*I should not have them all stand; the best one might stand somewhere near the middle, and perhaps the others would be leaning up or lying down.*) You may place them in a group. How are the axes of the pears now? Have you placed them the same distance apart? Why did you not have them all stand? (*They would be too nearly of the same height.*) What have you tried to get in this group? (*I have tried to get variety, so that the group would not be tiresome.*) Why did you not place the pears far apart?

Drawing-Book, *page 11.*— Drawing the Outlines of a Group.

Observation by Pupils. — Study the groups in the Drawing-Book. If you connected the bases of the objects in Fig. 1, what kind of a figure would you have? In Fig. 2? Describe the position of the axes of the objects with relation to each other in each group.

Directions. — Having arranged a group, study the proportion of the width to the height of the group. Indicate by light verticals and horizontals the space to be occupied by the group, making it of a suitable size for the page and of the proper proportion. Block-in first the group as a whole, then the principal object in the group, and then the others. Draw the table line, studying to place it well. Draw the curves over the blocking-in lines. Correct, erase wrong lines, and finish.



CHAPTER III.

DECORATION;

Or, Drawing as Applied in Ornament.

Decoration is the science and art of producing beauty in ornament. The study of the facts of form of objects in Construction, and of their appearance in Representation, is now properly followed by the study of Decoration, or the means of enhancing the beauty of objects.

Ornament, the product of purely decorative art, is always employed to beautify objects created for some purpose, independent of their decoration. It produces its legitimate effect when, without concentration upon itself, it makes the object to which it is applied more pleasing than if unadorned.

Fitness to its purpose is the underlying principle, — the very corner-stone of all good ornament. From this principle of fitness for its purpose there arises the fundamental law of ornament, — subordination. This law requires THAT ALL ORNAMENT SHALL BE MODEST AND MODERATE. Strong constrasts and striking effects violate it. Illustrations of this requirement in matters of good taste in general are familiar to all. A loud voice in conversation is not excusable; a forward, self-asserting manner is a mark of ill-breeding; gaudy colors in dress are shunned; showiness, or any other attempt to attract attention, is condemned. This requirement holds good in all ornament, whether architectural, domestic, or personal. He is not well dressed whose dress is conspicuous; that house is not well furnished where the furniture is obtrusive; that building is not well ornamented whose decoration is not subordinate to the idea of the building.

The Sources of Ornament. — The sources of ornament are geometry and Nature; and it is difficult at times to distinguish between these two sources; for a thoughtful consideration of Nature will show geometric plans and forms and modes of arrangement in her handiwork. Order, symmetry, and proportion are all exemplified in Nature in varying degrees.

Materials of Ornament. — The materials of ornament are —

1. Geometric plans, enclosing figures and units.
2. Conventionalized units derived from natural forms as motives.
3. Historic ornament.

But, in order to use these materials effectively, it is necessary to study —

(*a.*) Geometric construction and symmetric arrangement.
(*b.*) The proper use of plant forms as motives.
(*c.*) Well-selected examples of historic ornament.

Symmetric Arrangement. — The principal forms of arrangement (all requiring more or less of geometric construction) are —

1. A surface design, to cover a surface.
2. A border, to limit a surface.
3. A single arrangement, complete in itself.

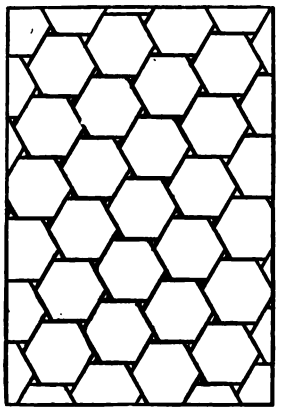
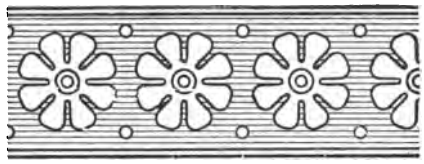


Fig. 1.



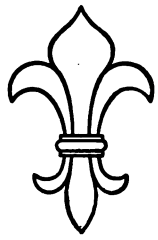


Fig. 3.

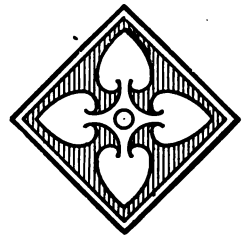


Fig. 4.

Proper Use of Plant Forms. — "Flowers must be something more than flowers to the designer; he must seek out the plan of development, and then adhere closely to natural laws." Lead pupils as deeply as possible into the study of Nature, in order that they may see for themselves the *spirit* of the plant which they are studying, as well as the more formal matter of arrangement. Then let them *conventionalize* plant forms for use in ornament, by keeping the characteristics of growth, curvature, and proportion while simplifying outlines and omitting details.

Historic Ornament. — In the past, many nations have produced certain ornament so repeatedly that the ornament has become characteristic of those nations. As the story of what a nation has done is called history, so the ornament produced by nations is called **historic ornament.** Different nations have developed different kinds of ornament; each kind, however, has a character or style of its own, hence styles of ornament are spoken of. The great historic styles are: the Egyptian, Greek, and Roman, — the ancient; the Byzantine, Romanesque, Saracenic, and Gothic, — the middle age; and the Renaissance, which may be called the modern. It is not intended at the present time to introduce any instruction on the different styles of ornament, as that would be quite beyond the capacity of the pupils. The purpose is to give beautiful examples of ornament suited to the ability of the pupils to appreciate and to reproduce. The study of the characteristics of each style is left for more advanced work.

EXERCISE IX. — Ornament. — Rosette.

From a Copy.

OBJECT. To study a rosette; to draw the rosette.

The Rosette. — The study of the rosette is well indicated in the work for pupils below. The rosette is a favorite figure in ornament, and is always made by the repetition of units around a centre, like the petals of a rose around its centre.

There are four kinds of repetition, —

1. Repetition on an axis.
2. Repetition in a straight line.
3. Repetition around a centre.
4. Repetition to cover a surface.

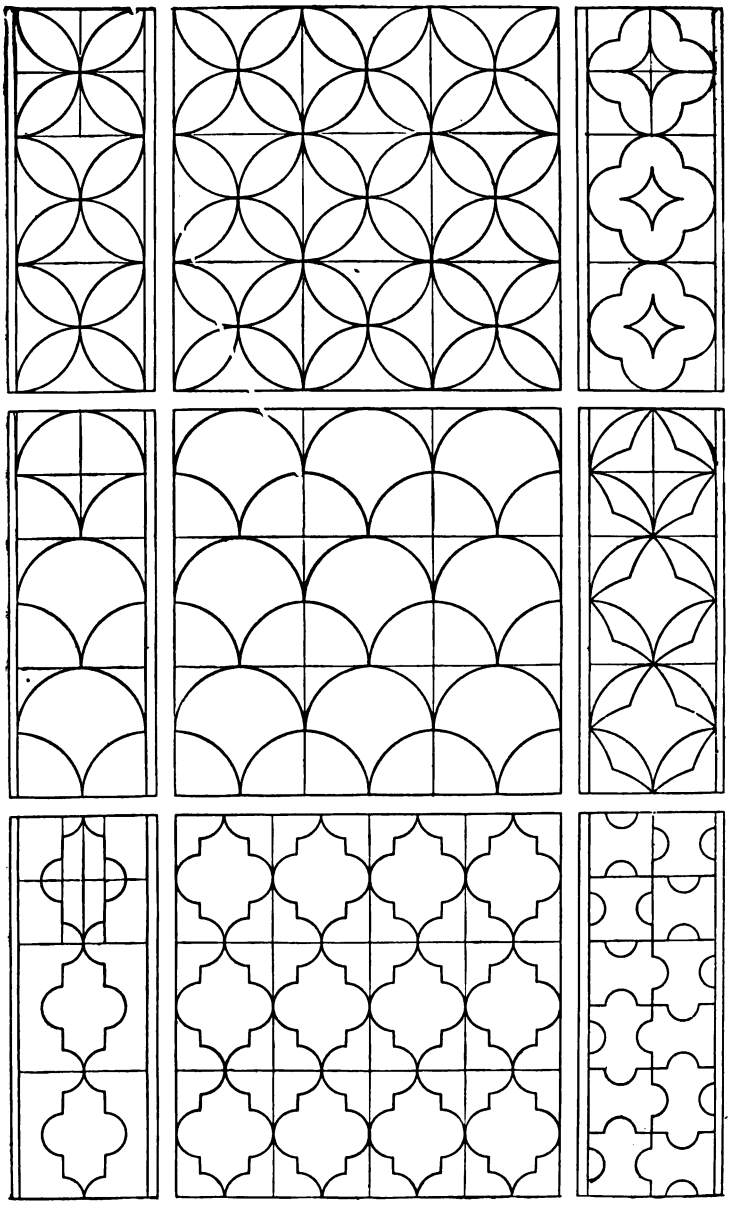
These are all illustrated in this lesson: repetition on an axis is shown both in the rosette and in the units composing it; repetition in a straight line is shown in the border on the Drawing-Book, page 13; repetition around a centre, in the rosette itself; repetition to cover a surface, in the drill exercise and in the same figure filled as a design for a surface covering.

The principal forms of arrangement mentioned on the previous page are also illustrated by this exercise, the rosette being the single arrangement complete in itself. As repetition enters into all these forms of ornament, it will be recognized as an important though simple feature in decoration. Rhythm in ornament is produced by the repetition of parts.

Do not try to have pupils analyze the rosette very closely; rather lead them to see its pleasing effect as a whole. The line used in drawing ornament should be a gray line of even texture.

The drill exercise given furnishes the needed practice on circles before drawing the rosette. It should not occupy ten minutes. It also gives a very primitive surface-covering as seen in the illustration below, at the left. The illustration at the right shows the same filled by a repetition of the rosette.

Patterns for covering even surfaces are often called diapers. They are usually based on the triangle or square, two elementary geometric figures, either of which, when repeated, will cover a flat surface without leaving interstices. By using curved lines instead of straight lines, or by using the two combined, you can easily secure a great variety of patterns, which, to the uneducated eye, will appear to be constructed in ways altogether different. An illustration of some simple surface-coverings is given here.



Diaper patterns can be properly used whenever you have a flat surface to be decorated, as in the case of woven fabrics, floors, etc.

To be developed. — **Unit of design; repetition; on an axis, in a straight line, around a centre, to cover a surface; rosette; beauty.**

Suggestions for Study of the Copy by Pupils. — What kind of repetition do you see on this page? (*I see in Fig.* 1, *repetition around a centre; in Fig.* 4, *horizontal repetition.*) What is Fig. 4? (*Fig.* 4 *is a border.*) What does Fig. 1 look like? (*It looks something like a flower.*) It is called a *rosette*, from its resemblance to a rose. What is the general shape of this rosette? (*The general shape is that of a circle.*) How many units are there in the rosette? (*There are eight units in the rosette.* What are the units like? (*The units are like triangles with the corners rounded.*)

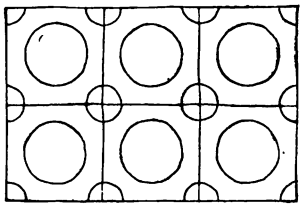
Drawing-Book, *page 13.*—Drawing the Rosette.

Observation Exercises for Pupils. — Can you think of any place where such an ornament would be suitable? Have you ever seen any rosettes as ornaments? Study Figs. 2 and 3 and give the steps for drawing the rosette.

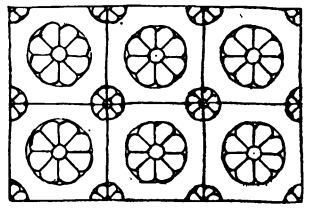
Drawing-Book, *page 12.*—Drill Exercise.

Practice. — Free movement, free drawing. Draw an oblong, leaving a half-inch margin about it. Trisect the upper side; from the points of trisection, draw verticals down the oblong. Bisect the left side; from the point of bisection, draw a horizontal across the oblong. Complete according to the directions on page 13, for Drawing-Book, page 1, and the illustration below. This very simple design to cover a surface can be made the basis of arrangement for a more elaborate design for a surface covering. As, for instance, the rosette of page 13 could be drawn in each circle.

Directions, page 13. — Follow the steps brought out in the study of the stages. Erase unnecessary lines, and finish the rosette, making it as beautiful as you can.



Drawing-Book, page 12, completed.



Design for a Surface Covering.

EXERCISE X. — Unit of Design, Modification of Unit as to Outline.

OBJECT. To study a unit and ways of modifying it by change of outline.

Unit of Design. — In the last exercise it was shown that repetition is a universal feature in decorative design, and the four modes of repetition were illustrated. Some of the figures used for repetition are to be considered in this exercise. A figure used for repetition in decoration is called a unit of design. The unit is an extremely important part in decorative work. It must have proportion, variety, grace in its outline. It must be simple and not obtrusive. Much practice and much study of proportion, curvature, and growth are required to make a really good unit. Therefore the study of the unit and different modifications is repeatedly given in this course of instruction.

Shape of Units. — Units may be circular, square, or oblong. Oblong units — that is to say, those that are longer one way than the other — may be either based on an oblong, Fig. 3; a rhombus, Fig. 4; a rhomboid, Fig. 5; or the figure known as kite-shaped, Fig. 6. It will be remembered that there is a difference between the adjective oblong and the noun oblong.

An oblong is a figure having four sides and four right angles; only its opposite sides being equal and parallel. The adjective oblong means simply longer one way than another, and does not define the shape of a figure, as it refers only to proportion.

The five rectilinear figures here given — the square, the oblong, the rhombus, the rhomboid, and the kite-shaped figure, or regular trapezium — are five of the six regular quadrilaterals. The sixth is the regular trapezoid. A trapezoid is a figure which has two of its sides parallel; a regular trapezoid is very easily made by truncating or cutting off the vertex of an isosceles triangle. The trapezium is a figure having no two of its sides parallel.

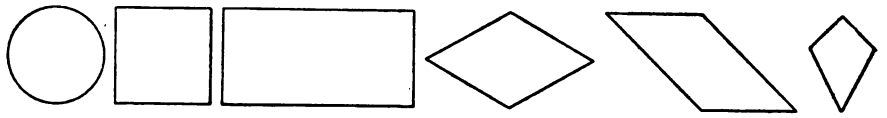


Fig. 1. Fig. 2. Fig. 3. Fig. 4. Fig. 5. Fig. 6.

The Kite-shaped Unit. — This has always been a great favorite. It has symmetry and proportion. Symmetry is produced by repetition on an axis, called the **axis of symmetry.** Proportion in art is the pleasing relation of unequal parts. This unit is susceptible of innumerable changes of outline and proportion, while still retaining its characteristics through all the changes, and remaining kite-shaped.

Its derivation from the oblong is interesting, — first, the oblong, Fig. 7, a figure having four sides and four right angles, only its opposite sides being equal and parallel;

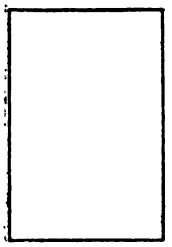


Fig. 7.

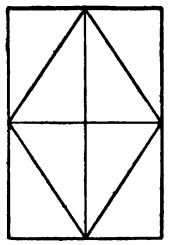


Fig. 8.

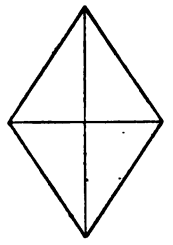


Fig. 9.

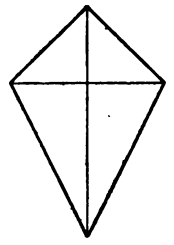


Fig. 10.

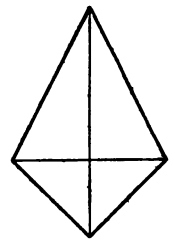
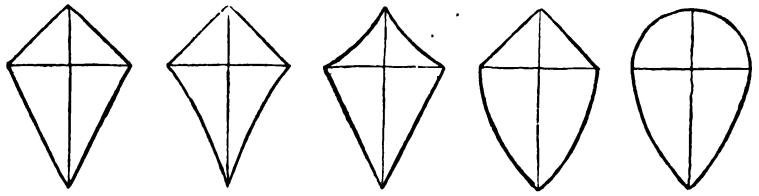


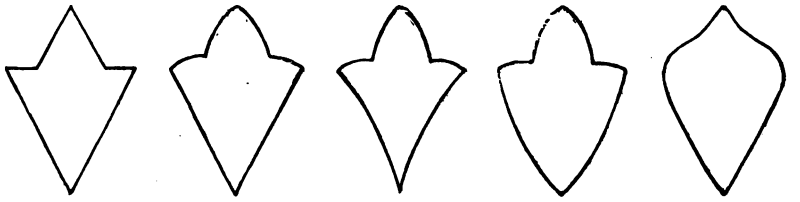
Fig. 11.

next, the rhombus, Fig. 9, a figure having four equal sides but none of its angles right angles, which may be obtained from the oblong by connecting the ends of its diameters, Fig. 8; then the kite-shaped figure, Figs. 10 and 11, an oblong figure having four sides those only being equal which are on opposite sides of the axis of symmetry. The kite-shaped figure may be obtained from the rhombus by changing the place of the short diameter, thus changing the place of the greatest width of the figure. As a diameter must pass through the centre of a figure, the horizontal in the kite-shaped figure is not a diameter, but simply a construction line marking its greatest width and showing, when compared with the axis, the proportion of the figure. The greatest width of the kite-shaped unit may be at any point in the axis outside the centre; or, in other words, considering the figure in its normal position, the greatest width may be above or below the centre, but not at the centre of the axis. Its normal position is with the axis vertical.



Modifications. — The line of illustrations above, from the Manual text for Book II., show some of the simple modifications that may be made in the kite-shaped unit by changing a part or the whole of the outline from straight to curved lines. The geometric derivation of this unit has already been shown. These modifications give a suggestion as to a possible derivation from a natural form, the leaf. See Manual, Part I. page 108. Thus, as has been said, it is difficult at times to distinguish between the two sources of ornament, geometry and Nature. Geometry contains the types or ideals of all form.

Further Modifications. — In this exercise modification in outline by division of the upper part is presented and illustrated below. In the modification of units, the curves should not be deep.



To be developed. — **Decorative design; kite-shaped unit; symmetry; proportion, modification by curves and by division; moderation in curves and angles; beauty.**

Suggestions for Study by Pupils. — What can you tell about this figure on the board? (*It looks like a kite.*) What should you think it might be called? This kite-shaped figure is used a great deal in decorative design. What is a figure called which is repeated in decorative design? (*It is called a unit of design.*) This unit is not always made of straight lines. Who can come and draw another unit of this general shape made partly of curved lines, either the upper part or the lower part? Do not try to make a great change, but try to make a pleasing unit. Who can draw another? and another?

We have now a row of kite-shaped units. Below this, I would like another row with the modification made by dividing the upper part. I will draw the first. Who will draw another? Try not only to draw well, but also to make a beautiful unit. Who will draw another? and another?

Drawing-Book, *page 14.* — **Modifying a Unit.**

Observation Exercises for Pupils. — What is Fig. 1? How could you modify it? What is given on the page? (*The construction lines for a unit are given.*) What would you call the vertical construction line? (*I would call it the axis.*) How can you make a figure symmetric? (*I can make it symmetric by making the part on one side of the axis like the part on the other side.*) Therefore the axis of a symmetric figure is called the **axis of symmetry**. What are you to do on this page? What caution is given you on the Drawing-Book page? Why?

Directions. — Fig. 1 is a unit of design. Construction lines like those of Fig. 1 are given for Fig. 2. On these construction lines, a symmetric unit differing in outline from Fig. 1 is required. Modify the outline by substituting curved lines, wholly or in part, for the straight lines of Fig. 1. In Fig. 1 the upper part is divided into three parts, and the points of division do not fall on the construction line. In the modification, the points of division may or may not be on the horizontal construction line. The curves should not be deep.

Practice movement for the curves before drawing.

EXERCISE XI. — Modification of Units as to Proportion and Outline.

OBJECT. To study ways of modifying a unit.

Proportion of Units. — In the previous exercise, modification of units as to outline was studied and practiced. A unit may also be modified by change of proportion of width to height and also by change of the place of the greatest width. The proportion of the width to the height of the unit as first given was as 2 to 3, as at Fig. 2. The unit may be modified, on the one hand, to make the width of the unit greater as at Fig. 1, or less as at Fig. 3, the height remaining the same; or, on the other hand, it may be modified so as to change the place of the greatest width as in Fig. 4, or lowering it as in Fig. 6. It is interesting to note that the resulting change of angles at the top of the unit is the same whichever kind of modification is used. The unit as first given, Fig. 2 and Fig. 5, is right-angled at the top; the changes made at Fig. 1 and Fig. 6 resulted in an obtuse angle at the top; the changes made at Fig. 3 and Fig. 4 resulted in an acute angle at the top. If the unit is not required to fill any particular space, as for instance in the case of a figure complete in itself, the proportion shown in Fig. 2 and Fig. 5 is a good one.

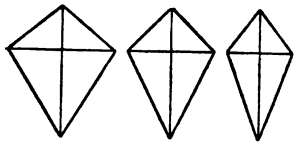


Fig. 1. Fig. 2. Fig. 3.

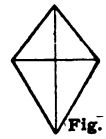


Fig. 4

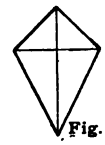


Fig. 5.

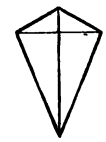
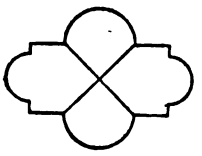


Fig. 6.

Proportion of Units to suit the Field. — If the unit is required to fill a given space, its proportion should be modified to fill the space well. For instance, any oblong figure to be filled with an arrangement about a centre will need two longer and two shorter units, varying perhaps both as to proportion of width to height and as to the place of the greatest width. The first thing to be considered in such a case is the space in which the unit is to be used. This space is called the **field**, and the unit must suit the field in general proportion. Thus in the oblong quatrefoil there are four fields, — two longer, two shorter. The longer and shorter units should correspond while modified to suit the space. Give blackboard exercises to the pupils that will bring out these points. Have them draw a horizontal row of units, showing modification by increasing and decreasing the width, and a vertical row, showing modification by changing the place of the greatest width. In these units the lines may be curved lines and the units may be divided at the top.



The Althea Leaf. — This leaf is illustrated in Fig. 1 on the Drawing-Book page. Nature is prolific in her suggestions for ornament. The althea leaf with its

three lobes may give the pupils an idea for the division of the unit. This pretty flowering shrub is well known and has the attractive common name of "Rose of Sharon." Some of the curvature may help in the modification of a unit. The wild currant may give another suggestion. The althea in blossom and the wild currant are illustrated here. Lead to Nature whenever you can; there is refreshment and strength.

To be developed. — Oblong quatrefoil; unit modified in proportion; modified by division; modified by changing place of greatest width.

Suggestions for Study of Drawing-Book, page 15, by Pupils. — Look at Fig. 2; what is its general shape? (*Its general shape is oblong.*) What is there on each side of the oblong? (*There is a semicircle on each side of the oblong.*) Do you remember any figure made of four semicircles? (*I remember a quatrefoil.*) What kind of a quatrefoil would you call this? (*I would call it an oblong quatrefoil.*)

You see a design in this oblong quatrefoil; how many units are there in the design? (*There are four units in the design.*) How do they compare with each other? (*Two are larger and two smaller; they look alike in outline, but they are not of the same proportion.*)

How have you already modified units? (*We have modified them in outline, by drawing curved lines instead of straight; and we have modified them by dividing them at the top.*) How else can a unit be modified? (*It can be modified in its proportion.*)

Will you come and draw the original simple unit, which had the proportion of 2 to 3? Will you come and draw another at the left of it, changing its proportion? And will you come and draw another at the right of it, changing its proportion differently? Can you think of any other way of modifying the unit, using straight lines and not dividing the top? (*I could raise the place of the greatest width.*) Will you come and draw the original unit and above it draw your modification? Will you come and draw a different one below the original unit?

Drawing-Book, *page 15.* — Drawing a Unit Modified in Proportion.

Observation Exercise by Pupils. — Look at Fig. 2; how are the units alike? How do the units differ? Why do you suppose they were made different? What holds them together? Look at Fig. 1. Describe the leaf. What are you to do on the page? Of what use will Fig. 1 be?

Directions. — Points are given for the construction lines of a unit differing in proportion from the one just drawn. Draw these lines, and on them draw a unit modified by curved lines and by divisions of the top. Practice movement before drawing.

EXERCISE XII. — Decorative Design. — Units Modified. — Arrangement about a Centre.

OBJECT. To modify units for arrangement about the centre of an oblong quatrefoil; to arrange them and to draw the arrangement.

Modification of Units. — In this exercise we take a step further and modify units for arrangement in an oblong quatrefoil, the proportions of which are definitely fixed. Before modifying the units, the spaces which the units are to occupy must be considered. By drawing the field lines (see page 56) these spaces are determined. In thinking of the units to occupy these spaces, there are several things to be remembered. The unit should cover only about two thirds of the field. All the units should radiate from the *centre* of the figure. They should not touch the enclosing figure, and while the field should be well covered by the unit it is not desirable that they should touch the field lines after leaving the centre. There should be a little free space about the units, otherwise there will be a crowded effect which will disturb the repose of the figure. It would be a mistake, therefore, to think that in order to have a unit cover a field well, it should occupy about all of the field.

The diameters of the quatrefoil are axes of symmetry of the figure, and each semidiameter may serve for the axis of symmetry of the unit (Fig. 1).

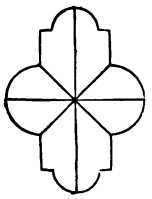


Fig. 1.

Now consider the shape of the upper field and how it can best be filled. If points *a* (Fig. 2) are placed in the upper field on the diagonals of the oblong, for the width of the unit, the field will be well filled in its width. A horizontal connecting points *a* would be the horizontal construction line for the unit. A unit may now be modified to suit the space. This unit can, of course, be repeated but once. Consider the shape of the left field; if points *b* (Fig. 3) are placed on the left side of the oblong in the left field, for the width of the unit, the field will be well filled in its width. The same or a different unit may now be modified to suit this field.

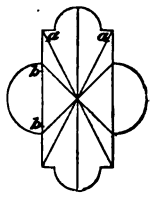


Fig. 2.

A central figure is now needed to hold the units together, to give the arrangement stability. Two centres are given on the page of the Drawing-Book; a square or oblong, or any figure developed from them, might be used. Three-sided or six-sided figures would not be suitable, because the enclosing figure is on the plan of four.

Develop these points by calling the pupils to the blackboard for rapid work, as in the preceding exercise. To save time, have two large oblong quatrefoils drawn upon the board before the lesson.

Arrangement. — In cutting units from colored paper and placing them properly within the enclosing figure, the pupils will realize better what is needed and will

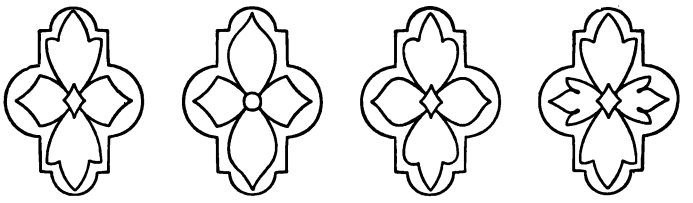
work more intelligently than if called upon to draw the design without making such an arrangement. It appeals to their sense of color, which gives them much pleasure and helps them to realize the unit as a whole in a less abstract way than that of making the outline. This is also an exercise in manual training calling for skill and care both in the cutting and the pasting. The pasting affords an opportunity for a good object lesson on neatness.

To be developed. — Field; field lines; enclosing figure: modification of unit to suit the field.

Suggestions for Study of the Quatrefoil by Pupils. — What is the figure on the blackboard? Within it we wish to have an arrangement of units about a centre. How many units should there be? How will you know what shape to make them? (*We must think of the spaces they are to fill.*) Will you come and show me just how to determine these spaces in this figure? What is an enclosed space of ground in the country called? What might these spaces be called? How much of each field should you occupy with the unit? Where should your units start? How much space should there be between the unit and the lines of the field and of the enclosing figure? (*There should be enough space to give them room, not to crowd them.*)

Drawing-Book, *page 16.* — **Arranging Units to make a Design and Drawing the Design.**

Observation Exercises for Pupils. — What are you to do upon this page? What color would you prefer for your figure? How much space should there be between the units and the outline, or **enclosing figure?** (*There should be about a quarter of an inch for this figure.*) Look at Fig. 2 on page 15. What can you say about the larger and smaller units as to general outline? You may make your units all of the same general outline, or you may make one pair differ in outline from the other pair. Look at Fig. 1 on page 15; *this* may suggest to you a modification of a unit.



Arrangement. — Decide on a unit. Cut from colored paper two units to be placed on the vertical diameter of the quatrefoil, and two of proper proportions for the horizontal diameter. Draw the diameters of the quatrefoil, Fig. 1; arrange the units to meet at the centre, and paste them at the centre. Cut a central figure like Fig. 3 or Fig. 4 and paste on the design.

Drawing. — Draw the diameters of Fig. 2. On these diameters draw the design arranged in Fig. 1. Draw the units by opposites. Erase diameters and lines within the central figure. Finish the design with broad, soft lines.

EXERCISE XIII. — Ornament.

From a Copy.

OBJECT. To study an historic ornament; to draw its outline.

Historic Ornament. — The study of historic ornament is a most important means of cultivating the taste as well as of promoting skill in execution. In historic ornament, proportion, distribution, curvature, all combine to make wonderfully beautiful results, — the final expressions of the effort of many generations to attain beauty.

The first attempts at ornament were extremely rude, mere scratches, which by their repetition produced pleasure, responding to the sense of rhythm innate in man. These developed into more intelligent markings and figures. As time went on the figures grew more refined. The character of ornament grew with advancing civilization, the increasing love for growth and for beauty wrought into it the aspirations of the age, until finally the ornament of a nation expressed the characteristic ideas of the nation. Thus styles of historic ornament were developed. It is a most interesting study to trace the development of a style of historic ornament. In this development you will find the history of the people interwoven; studied carefully, it will tell you of the religion, the laws, and the temperament of the people.

The example of Moorish ornament given in this exercise illustrates the significance of historic ornament in a striking manner. To understand it thoroughly you must know of the high civilization of the Moors, their conquests, their laws, and their religion. It is the simplest state of a figure which prevails throughout their ornament; it may be found modified by almost innumerable changes in curvature and by subdivision, but still retaining the distinguishing features of the type. This is so beautiful and characteristic a figure that it is a good example for a memory exercise. It should be learned by the pupils as one of the classics of decorative art. It might also be used as the basis of a language lesson.

The illustrations above are historic variations of the copy. An example is given in the Drawing-Book of its use in an Arabic border. A purely original figure is not always necessary in ornament; in historic ornament there will be found many modifications of a favorite figure.

To be developed. — Historic ornament; graceful curvature in Moorish ornament; full curves, sharp angles, few straight lines; absence of plant form; memory of historic ornament.

Suggestions for Study of the Copy by Pupils. — What is history? (*The story of the past.*) When can we call an ornament **historic**? (*When the ornament is recognized as having belonged to the decorative art of some nation or people in the past.*) The Moors were a people of dark complexion who lived in the northern part of Africa, and also in Spain. They were highly educated, and produced a great deal of beautiful decoration. But as the Mohammedan religion forbade the imitation of animal or plant forms, their ornament was geometric in general character. The ornament given in this exercise was a favorite form in Mohammedan art, and can be traced in various modifications all through Arabic and Moorish decoration. These are both included under the general style Saracenic.

Drawing-Book, *page 17.* — **Drawing the Ornament.**

Observation Exercise for Pupils. — Two examples of historic ornament are given upon this page; Fig. 1 is Moorish, Fig. 2 is Arabic. What are you to do upon this page? How can you get the general shape of the figure? (*By drawing construction lines and by blocking-in.*) What do you see in Fig. 2? This is an Arabic border. Can you find any Arabic numerals on the page? Can you find any Roman numerals on the page? Please come to the board and make the Arabic numerals from 1 to 10; now the Roman numerals from 1 to 10. What particular difference do you see? (*The Arabic numerals are almost all curved lines; the Roman numerals are almost all straight.*) Now look at Fig. 1; what do you notice? (*There are no straight lines in it.*) What do you notice in Fig. 2? (*There are no straight lines in it, except the marginal lines.*) The curves are very beautiful, in Fig. 1 especially, and have their own peculiar character, which you must study well. How do you study a curve? (*We study it a good deal by movement.*)

Directions. — On the copy draw a light vertical as an axis of symmetry; also horizontals to connect the ends of opposite curves.

Draw the figure in the space at the right, enlarging it to fill the space. First draw the axis of symmetry and two horizontals to correspond to those drawn on the copy. For each curve, practice first movement on the copy, then over the space at the right, then draw with one sweep. Erase construction lines and errors, and complete the figure in broad, soft lines.

CHAPTER IV.

REVIEW.

Construction, Representation, Decoration.

IN the closing exercises of the book, each of the three subjects is reviewed. in order to leave clear impressions in the pupils' minds in regard to their character.

EXERCISE XIV. — Vase Form.

From a Model or Copy.

OBJECT. To study a vase form; to draw a vase form.

Vases. — The first rude attempts at pottery were doubtless in the form of bowls, the only thought being to provide a receptacle. Later came the idea of beauty. The eye studied proportion and curvature and effect as a whole, and delighted in subtile outlines, easy to follow but hard to analyze, until the vase form came to hold within itself some of the highest art ideals of the people. Some one has said that "the civilization of a nation may be traced and read through its pottery forms." This is but another way of saying that art is our most complete and perfect mode of expression. Greek vases made of simple clay rank among the finest art treasures of the world; thus art ennobles and glorifies the rudest materials with which it may work.

The vase which is the subject of this exercise is very simple; its curves are circular; its proportions are easily found. The more mysterious curves of the ellipsoid and the ovoid are left for later work. The profiles are beautiful, however, for the eye moves with ease and pleasure along the reversed curves which make part of its outline, and finds sufficient variety in the proportion of the various widths to each other and to the height.

A simple vase like this does not present much need of technical terms; it has a base, a body, a neck, a lip. It must be noted that the lip is not sharp. As a sharp edge would be very unpleasant in a vase, sharp angles in the drawing at the top give a feeling of unrest and discomfort, for they represent a sharp edge.

In giving this exercise, seek to bring up the pleasant associations that cluster round a vase, — bright, graceful flowers, sweet odors, and the relief of the cool, quiet green of the leaves; still more, the pleasant thoughts that go with them as bearers of special messages of affection. It will be better for the awakening of these associations if a vase or a vase-form like this can be procured for this exercise.

Drill. — The drill exercise will give the continuity of movement so desirable in all drawing, but especially in that of reversed curves. By studying the curve of the profiles of the vase, you will see that it reverses three times. The curve begins by curving outward for the lip, then curves inward for the neck, then outward for the body, and finally inward slightly for the base. If the pupils have had thorough training in the Primary Manual, "The Use of Models," elliptical and ovoid reversed curves may be substituted for the circular curves both in the drill and in the vase.

To be developed. — **Reversed curves; purpose of a vase; profiles; circular curves; beauty of form.**

Suggestions for Study of the Vase by Pupils. — What is there pleasing to you about the vase? Will you tell me of what it makes you think? Is it anything like the flowers? Can you tell me about any vase with flowers that you have seen? Do you often see a vase without flowers?

Drawing-Book, *page 19.* — **Drawing a Vase.**

Observation Exercise for Pupils. — What do you see upon the page? Can you trace the profiles in the air with both hands? I would like to have some of you try at recess to draw the vase on the board with both hands. Think of flowers in the vase while you trace the profiles. What flowers did you think of as in your vase? And what did you think of? What are you to do on this page? Where is the vase the narrowest? Where is it the widest? What do you notice about the width at the top and bottom? What do you notice about the profile as you move from top to bottom? What does the printed horizontal show?

Drawing-Book, *page 18.* — **Drill Exercise.**

Practice. — Draw a vertical downward from each point given. Bisect each vertical. Practice movement over the printed copy, and draw repeatedly and continuously so as to get the full motion of the curve. Practice the same movement and draw in the same way, repeatedly and continuously, on each vertical.

Directions, page 19. — Bisect the printed horizontal; from the point of bisection draw the axis of the vase. Bisect the vertical. Through the point of bisection, and through the lower end of the vertical, draw horizontals equal to the printed horizontal, and draw the base. Practice movement over the printed copy for the left profile, then for the left side of the vase to be drawn, then draw; repeat for the right. Erase errors and construction lines, and finish with soft, gray lines.

EXERCISE XV. — Covered Box. — Appearance below the Level of the Eye.

From an Object, if possible.

OBJECT. To study the appearance of horizontal circles below the eye as seen in a cylindric object; to draw the appearance.

Appearance of the Box. — For this exercise, each pupil should have the box made for Exercise II. It will be well to spend a few moments with them at first on the apparent shape of the top of the box, — an ellipse; also of that part of the edge of the rim that can be seen, — a half ellipse a little deeper in curve than the ellipse at the top; and of that part of the lower edge that can be seen, — a half ellipse curving a little deeper still. The imagination may be appealed to as to the edge of the rim and the lower edge of the box, so that in drawing, the thought may carry the half ellipse *around* at the ends rather than have it meet the profile at a sharp angle.

Drill Exercise. — A page for drill on ellipses is again given here, so that the pupils may be prepared for drawing the box. The exercise should not occupy ten minutes. The ellipses should be drawn with perfectly free movement.

Measurement on the Pencil. — The use of measurement on the pencil is to obtain proportion, and when the pupils fully understand the purpose, they will be delighted with the experiments. The teacher draws upon the board vertical oblongs of different proportions. If the schoolroom is wide, it will be better to have several such oblongs, — some at the left, some in the middle, and some at the right end of the board. The teacher gives the following directions, and sees that each is intelligently carried out before proceeding to the next, explaining that the measurement to be taken first is the width of the oblong; next the height of the oblong. The exercise may be varied by suspending a slate from the blackboard as an object to be measured.

Remember that these measurements give proportion only, *not* size.

In measuring horizontally great care should be taken that the pencil is *parallel* to the line of the eyes; in measuring vertically, that the pencil does not incline either backward or forward, either to the right or to the left.

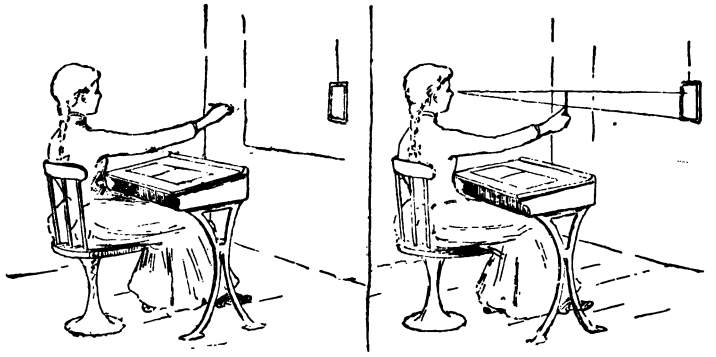
All measurements should be taken with shoulders resting firmly against the back of the chair, pencil held at arm's length, and with one eye closed.

Position, and Practice by Pupils in Holding the Pencil for Measurement. — Sit well back in the chair, with head erect and shoulders resting firmly against the back of the chair. Grasp the pencil in the middle with the fingers, leaving the thumb, and, as occasion demands, the forefinger, free to move along the pencil.

Hold the pencil horizontal and *parallel* to the line of the eyes, at arm's length, with the point to the right. Drop the hand to rest. Hold the pencil vertical (not inclining either backward or forward, either to the right or the left), at arm's length, with the point downward.

Measuring Horizontally. — Sit back in the chair, close one eye, and hold the pencil horizontal, at arm's length, with the point to the right, and so that the left end appears to be just at the left side of the form or figure to be measured; move the thumb until it appears to be just at the right side of the form or figure, Fig. 1.

Measuring Vertically. — Hold the pencil vertical, at arm's length, with the point downward, at such a height that the upper end of the pencil appears to be exactly on a line with the upper side of the form or figure to be measured; move the thumb up or down the pencil until the thumb appears to be on a line with the lower side of the form or figure.



Comparing two Measurements. — Remember always to take the *same* position (back in the chair, pencil at arm's length) for any two measurements that you wish to compare; *and that the measurements give proportion only, not size.* Take the shorter measurement on the pencil, *keep it by holding the thumb fixed;* turn the pencil and compare this measurement with the longer, by seeing how many times the shorter measurement can be repeated in the longer.

Find the proportion of width to height in the various oblongs. (The teacher places the waste-paper basket where all can see it.) Measure the height of the basket and its width at the top; which is greater?

To be developed. — Measurement on pencil; proportion; review of Exercises V. and VI.

Suggestions for Study by Pupils of a Cylindric Object — a Covered Box. — Measure the height and width of the appearance on your pencil; how does the height of the appearance compare with the width? What is the appearance of the top? Measure the width of the top from back to front, and its width from left to right on your pencil; how do they compare? What is the appearance of the lower edge of the cover? Of the lower edge of the box?

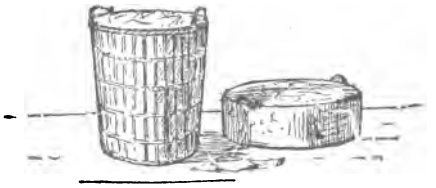
Drawing-Book, *page 20.* — Drill Exercise.

Practice. — Use this page for a drill exercise before drawing on page 21. Three ellipses differing in proportion are printed. Practice movement (see Fig. 6, page xiii) on the upper ellipse, moving in the order 1, 2, 3, 4. Repeat the movement half an inch to the right, and draw an ellipse with one sweep of the pencil. Repeat. Following the same order draw two ellipses at the right of the second and third ellipse. *No erasing.*

Drawing-Book, *page 21.* — Drawing the Appearance of the Box.

Observation Exercises for Pupils. — What kind of a box is represented in the Drawing-Book? What is the actual shape of its top view? (*A circle.*) What is the appearance of the top in the picture? (*Like an ellipse.*) Why was it not made the actual shape?

Directions, page 21. — Obtain the proportion of the height to the width of the box by measurement on the pencil. Draw according to the directions given for drawing the cylinder. Make a large drawing and finish it in broad, soft lines, drawn with continuous movement.



EXERCISE XVI. — Group.

From Objects.

OBJECT. To arrange a pleasing group of fruit; to study the appearance of the group; to draw the appearance.

The Arrangement of a Group. — In studying the arrangement of a group, consider, —

1. The place of the principal object.
2. The place of the secondary objects.
3. The figure made by the group on the table.
4. Partial view of some of the objects.
5. Upper line of the group.
6. **Variety** in the positions of the axes and in the faces visible.
7. **Repose** of the objects.
8. **Unity** of the group — distance between objects.

Recall these topics to the pupils by arranging a group where all can see, and calling not only for opinions as to the arrangement, whether it is pleasing or not, but also for changes that should be made and the reasons for them. The topics are stated more in detail on page 44. It will be noticed that unity, repose, and variety are emphasized as of particular importance. They are indeed essentials in all good pictorial composition. There should be variety, but it should be subordinate to unity. A variety of things having no apparent connection with each other gives no pleasure in a picture, and distracts rather than composes. Delicate fruit grouped with rougher vegetables seems inharmonious; there is no unity. They have not enough in common, either in the purpose which they serve or in their general appearance. The arrangement is incongruous. Only the most hardy fruit should be grouped with vegetables. Where unity is lacking, repose is always lacking.

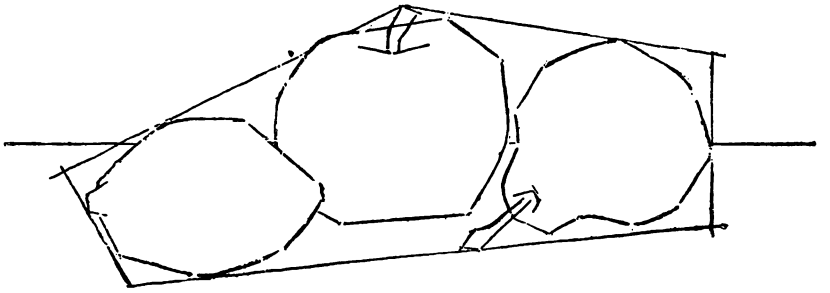
This exercise can also be varied to advantage by asking pupils to bring in pictures of groups of objects, of animals, or of people (see page 47), to be studied with reference to these points by the class.

The blocking-in of the groups given in the Drawing-Book is given here for the help of the teacher. It is of course understood that the illustrations of the Drawing-Book are given only as suggestions, and are not to be copied.

To be developed. — Grouping; principal object; secondary objects; pleasing effect; unity, variety, repose.

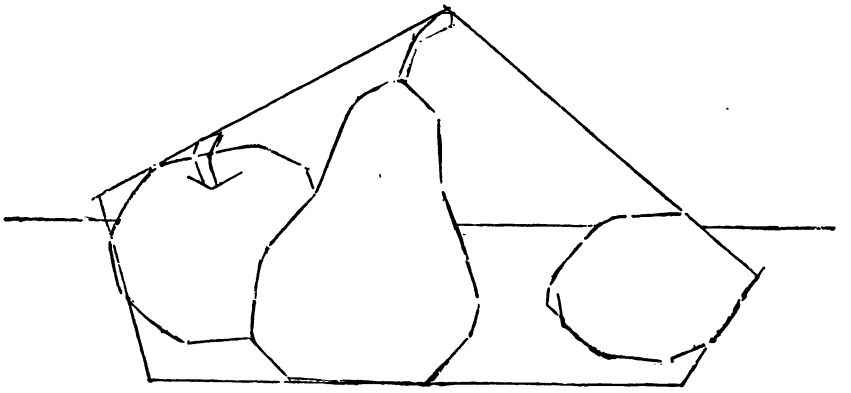
Suggestions for Arrangement of a Group by Pupils. — Arrange a group of two, or at the most three, very simple forms, either of fruit or of vegetables. As you arrange

the group, study it with reference to each of the points mentioned. Describe the place of the principal object; of the secondary objects; the kind of figure made by the group on the table. Are your objects all in plain sight? Describe the upper line of your group. What have you done to secure variety? Do your objects seem to belong together, and do they look restful? The aim should be to make the group as pleasing as possible in general effect.



Drawing-Book, *page 11.* — Drawing the outlines of a Group.

Observation by Pupils. — Describe the illustrations in the **Drawing-Book**, with reference to the points mentioned. Improve the arrangement of your own group if you can.



Directions. — Having arranged a group, obtain the proportion of the width to the height of the group, by measurement on the pencil, as illustrated on page 66. Indicate by light verticals and horizontals the space to be occupied by the group, making it of a suitable size for the page and of the proper proportion. Block-in first the whole group, then the principal object in the group, and then the others. Draw the table line, studying to place it well. Draw the curves over the blocking-in lines. Correct, erase wrong lines, and finish.

EXERCISE XVII. — Ornament derived from a Natural Form.

From a Copy.

OBJECT. To study an ornament derived from a natural form; to draw it enlarged.

Influence of Nature in Ornament. — This exercise illustrates a point that is sometimes a little difficult to be understood, — the influence of Nature in ornament. Botanic study has called much attention to serrate, crenate, dentate, and repand margins of leaves, to the network of veins, to the stamens and pistils, to ovaries, styles, stigmas, carpels, with minute details. All these are very wonderful and beautiful in themselves and worthy of the most careful study. But he who has seen only these has lost much of Nature and has passed her greater beauties unnoticed. The sweep of the curve of a leaf; the beautiful spreading shape of the blade with its varying aspects as it turns this way and that; the grouping, the masses, — in short, all that is revealed in the art study of a leaf is forgotten in the scientific study. Hence it is a little hard for those who have been busy with the details to realize that the expression, the spirit of a leaf lies in it considered as a whole or in relation to other leaves, and that some of this may be given even in a little bit of a curve taken from it. So in all historic ornament, even in the Moorish, where Nature was forbidden, the effect of the influence of Nature in her wider aspects appears in lines of growth, in graceful shapes, in proportionate distribution. Do not think it necessary, or even well, to produce in ornament the details of natural forms; rather have in mind the plan that underlies the whole and try to express something of that. Study several leaves of one kind; find the beauties of each and imagine a leaf combining these beauties. Children may be led to see these things also and to grow into the feeling for this wonderful spirit of Nature. Select two or three large leaves of different kinds. If the stems are long, let them remain so.

To be developed. — **Love of Nature; art study; axis of symmetry; beauty of curvature; leaf as a whole.**

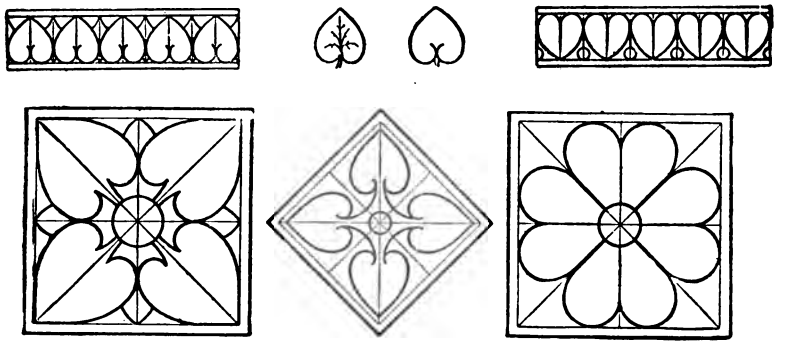
Suggestions for Study of Leaves by Pupils. — Look at the leaf which I hold. What has this leaf? (*It has a leaf-stalk, a blade, an apex, a base, a midrib, and veins.*) Can you see the midrib? How many can? Only a very few see it. Why do you say it has a midrib? (*We have handled leaves, and they all have had midribs, and the stalk seemed to be carried right along to the apex.*) Move your finger in the air as the leaf-stalk seems to go, beginning at the bottom of the stalk; move along to the base of the leaf and continue the movement through the leaf. Try it again; where does the movement carry you? Will you draw that curve on the board? You have carried your

feeling and your thought of the beauty of the curve right to the board, and there it appears now in your drawing. Let us try another leaf. Let us try the curve at the margin; begin at the apex this time and sweep right down the margin clear to the end of the leaf-stalk. Trace the sides with both hands, beginning at the apex. Will you carry your thought of this curve and your feeling of this movement to the board?

Drawing-Book, *page 23.*—Drawing an Ornament.

Study of the page by Pupils.— What is Fig. 2? (*Fig. 2 is the picture of a morning-glory.*) How do you recognize it? (*I know it by the flower.*) Do you know the shape of the leaf? How many leaves are there in the picture? Look at the lower one on the left; what is the shape? (*It is heart-shaped.*) And what is the shape of the upper leaf on the left? What is Fig. 1 like in general shape? Compare Fig. 1 and the leaf. Here is a morning-glory leaf; will you trace it with both hands? Notice the beauty of the curves; practice them on the copy with both hands. Can you draw the figure on the board with both hands? What else do you see upon the page?* What do you see in Fig. 3 that is like the morning-glory leaf?

Drawing.— Draw upon the copy a vertical as a centre line and a horizontal through the greatest width. In the space at the right draw a vertical connecting the points given. Draw an indefinite horizontal to show where the greatest width of the figure should be. Practice movement for the left curve and draw with free movement; repeat for the right curve; the same for the curves of the stem. Erase construction lines and finish freely.



* The border, Fig. 3, made by repetition, is very suitable and effective for outline embroidery. Encourage all efforts at hand-work by the children.

OPTIONAL EXERCISE.

THE last pages in the Drawing-Book may be used for an exercise on any part of the work in the book in which the teacher may think the pupils need further practice, or it may be given to an exercise in color.

Color. — As some teachers using this Manual may not see what is said on Color in the Manual, Part I., or Books I. and II., it is thought best to repeat it here, with some addition with regard to the tertiary colors.

The use of color in the study of form will be found of great value. Color exercises are therefore suggested for each book. The primary, secondary, and tertiary pigment colors and their combinations are presented in their order and with reference to their relative values.

Color-lessons should not be given at random. They should have an orderly succession and should have a twofold purpose: 1. The development of the color-sense; 2. The development of the power of expressing with brushes and paints, or other color materials, the color-impressions made upon the brain.

The Color-Sense. — In all schemes for color-lessons, the color-sense should be made the starting-point. Care should be taken that a color impression or sensation should *always* precede the *name* of the color. To this end, exercises in matching colors of objects should be given before color-names are given.*

The Names of Colors. — The colored objects, whether colored cards, paper, worsted, or any other material, from which color-names, as yellow, red, blue, orange, green, violet, purple, citrine, russet, olive, are learned, should be those which are known as standard colors. Great care should be taken, therefore, in selecting material for these lessons.†

Tints, Shades, Tones, Scales. — The children can also learn the *tints* and *shades* of colors, and can learn to arrange them in *scales* of color.

Tints are those *tones* of a color lighter than the standard color.

Shades are those *tones* of a color darker than the standard color, obtained by mixing black with the standard color.

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* Provision has been made for such exercises in the Color Chart and Cards for the Primary Education of the Color-Sense by Dr. Hugo Magnus and Dr. B. Joy Jeffries; published by The Prang Educational Company.

† Prang's Colored Papers have been prepared with special reference to their use in cultivating the color-sense.

A *scale* of any color is made by arranging its tints, standard, and shades in successive order from light to dark or from dark to light.

A *dulled* scale is made by mixing gray with all the tones of the scale.

By the combination of secondaries, tertiaries are produced. Each tertiary contains all the primary colors, with a double portion of one of them.

Secondaries.	*Tertiaries.*
ORANGE and GREEN	make CITRINE or ORANGE-GREEN, named the yellow tertiary, as it contains red, blue, and a double portion of yellow.
ORANGE and VIOLET	make RUSSET or ORANGE-VIOLET, named the red tertiary, as it contains yellow, blue, and a double portion of red.
VIOLET and GREEN	make OLIVE or VIOLET-GREEN, named the blue tertiary, as it contains yellow, red, and a double portion of blue.

There is an infinite variety of colors compounded from those mentioned, of which some are named and some unnamed. These must be left for more advanced study.*

Color Combinations. — Practical Points in School Work. — The subject of Decoration calls especially for a knowledge of harmony of color, and there is frequently much work done outside of the books by the use of colored paper. The study of Decoration begins in the primary schools with the attempt to make pleasing arrangements with solids, tablets, and colored paper. As soon as the element of color enters, training in the harmony of color should begin. The training at this early stage should be rather negative than positive; statements as to harmony of the different primaries, secondaries, and tertiaries are not necessary.

But inharmonious combinations should be made impossible by the observance of the following rules by the teacher: —

In choosing colored papers for use in the schoolroom, be careful first to get *standard* colors; if you can, add to these tints and shades of the various colors, so that scales of colors can be made.

At first, call for arrangements in standard colors, only one color to be used in any one arrangement; then for arrangements in tints, only one tint to be used in any one arrangement; then for arrangements in shades, only one shade to be used in any one arrangement.

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* Those desirous of investigating the subject for themselves will find some simple but very interesting experiments in the combinations of the primary spectrum colors in No. 1 of Appleton's Experimental Science Series for Beginners, Light, by Alfred M. Mayer and Charles Barnard.

Later, when combinations are made, let them be —

(1) { Of two tints of the same color.
Of two shades " " "

(2) { Of a standard with a neutral gray.
Of a tint " " "
Of a shade " " "

Do not call for nor allow any combinations of (1) standard primaries, (2) of secondaries, (3) of primaries and secondaries.

If an object is represented by colored papers, do not allow any combination of two colors that would not be pleasing and suitable in the object.

If these rules are followed, the children will receive an unconscious training in the harmony of color; discords of color will seem glaring to them. In imitation, they will carry out harmony in their work with the brush.

Paints. — While the children are receiving color-sensations, and learning color-names by the study of colored objects, they can also begin to produce color-effects by the use of paints.

Beginning with yellow, red, and blue, they can learn, by mixing these colors, the results produced.

YELLOW and RED, mixed, make ORANGE.
YELLOW and BLUE, " " GREEN.
RED and BLUE, " " VIOLET.

The three mixed in varying quantities produce browns and grays.

The Use of Water-Colors. — With a brush full of clean water obtain the full strength of color from the cake, and then transfer it to the spaces in the cover of the box as to a palette. Add color or water as strength or delicacy of tint is required.

Rarely mix more than three colors; and do the mixing upon the palette, and not upon the cakes. This is best practice at first, though after obtaining a good knowledge of color, and skill in handling, it is sometimes better to work directly from the cake, mixing in the brush.

The Use of Brushes. — Be careful to use clean water, that is, water not charged with much color by previous mixing; and always put the brushes and box away quite clean.

A hollow sponge held in the left hand is useful to remove superfluous color from the brush, thus keeping the water clean.

Do not leave brushes in the water or put them in the mouth. When ready to put the brush away, wash it thoroughly in clean water, and give it a quick shake; this removes the water, while bringing the brush to a point and preserving its shape.

Working in Water-Color. — Work from the left to the right, and from the top downward. Do not let the surface of the paper lie flat, but slope the lower part toward you.

Keep the brush full of color, and work generally with the side of the brush, using the point only for lines. Surplus color can be removed, if taken up quickly, by using a nearly dry brush, blotting-paper, or a soft rag.

Color. — The relative values of the primary pigment colors — yellow, red, and blue — can first be recalled to the pupils. It is supposed that pupils have already learned to recognize citrine, russet, olive, and to know their names.

The teacher should pin up, where all can see, three oblongs of paper of the same size, — one standard citrine, one standard russet, one standard olive, and observations should be made by pupils as to their values.

Questions can then be asked about the primary colors necessary to make the secondary colors, — orange, green, and violet; also about the colors necessary to make the tertiaries.

In mixing colors which require red, use carmine or lake; vermilion is not a good mixing color.

The arrangement of the page can be laid out according to the directions below, and the oblongs colored according to their extent.

If colors and a brush cannot be used, the page can be carried out by cutting oblongs from colored paper.

Observation Exercise by Pupils. — Who will tell me something about the oblongs? (*One oblong is citrine, one is russet, one is olive.*) Those in the last row may answer now. In which oblong can you see the most color? In which next? What can I do so that you will see no more color in the citrine and in the russet than in the olive? (*You can cover up some of the citrine and some of the russet.*) Of which shall I cover the most? Which color do you like the best?

Drawing-Book, *page 24.* — Exercise in Color.

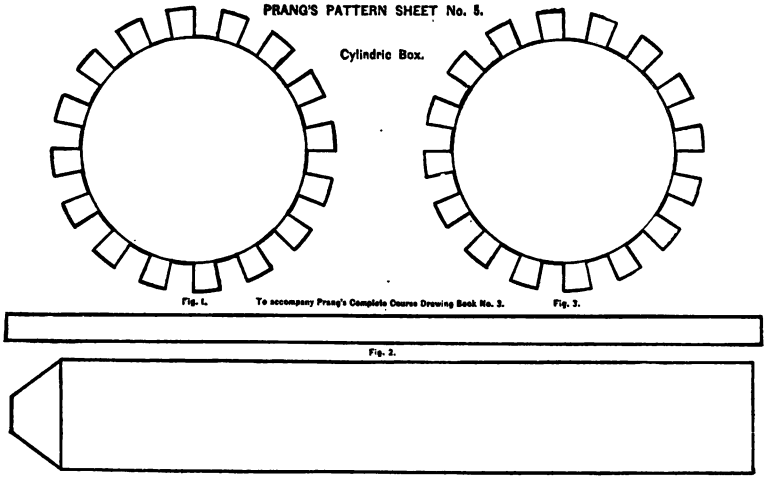
Observation Exercise by Pupils. — What colors would you mix to make citrine? What colors would you mix to make russet? What colors would you mix to make olive? We wish to have three oblongs colored citrine, russet, and olive. Which oblong should be the smallest? Which should be the next in size? Which should be the largest?

Directions. — Bisect the upper edge of the page, and an inch below the point of bisection place a point, thus dividing the page. Bisect each half, thus making four parts. Trisect each part. Number the points of trisection 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11. Bisect the distances between 2 and 3 and between 3 and 4, and place points *a* and *b* a little to the left of the points of bisection. From points 1, *a*, *b*, 7, 8, and 11 draw verticals to within half an inch of the lower edge of the page. Draw horizontals from 1 to *a*, and from *b* to 7, and from 8 to 11. Complete the oblongs by drawing the lower horizontals. Color the narrowest oblong citrine, the next one russet, and the last olive.

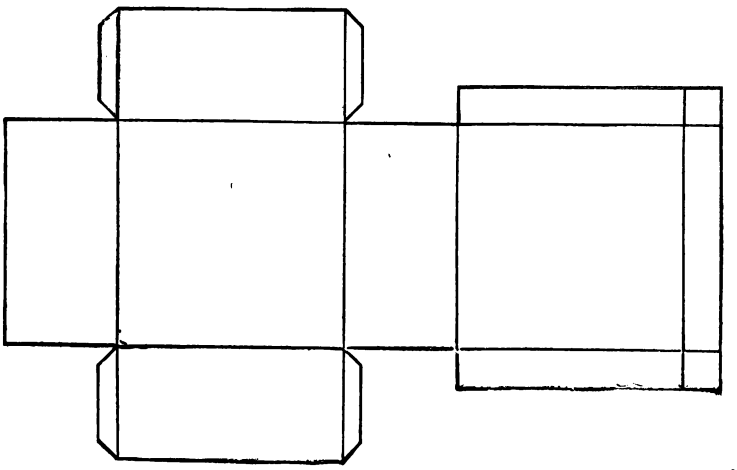
PATTERN SHEETS.

PRANG'S PATTERN SHEET No. 8.

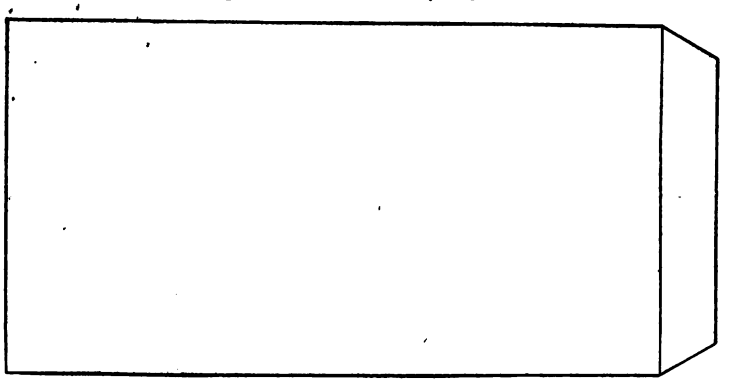
Cylindric Box.



Prang's Pattern Sheet, No. 6. Square Box.



Prang's Pattern Sheet No. 7. Cylinder.



Illustrations are given here of the pattern sheets which accompany Book 3.

In Exercise II., a cylindric and a square box are called for to be used for the study of views. These boxes are made by cutting out, pasting, and folding the patterns on Pattern Sheets Nos. 5 and 6. After the boxes have been used in this exercise, they should be preserved for use in studying the appearance in Exercise XV., and still further for use in Exercise IX. Book IV.

In Exercise V., the appearance of a cylinder below the eye is to be studied. The cylinder is made by cutting out, pasting, and folding the patterns on Pattern Sheet No. 7.

Making objects from the patterns furnishes objects for study as well as opportunity for care and skill in manual work.

FORM STUDY AND DRAWING IN OTHER STUDIES.

The work in Form Study and Drawing will produce comparatively small results unless teachers recognize its close relation to everything about us, and hence the use that can be made of it in all the elementary as well as many of the higher studies. The pupils should be constantly observing form, and as constantly expressing it through drawing. The teacher's work at this stage should be so laid out that Form Study and Drawing will be constituent parts of all school work, whether Number, Geography, Language, Science, History, or Manual Training. Manuals are now in preparation that will show how Form Study and Drawing may be used to enliven and enrich all other school work. Pupils need no urging to do illustrative work; they need only permission and encouragement. If such work is arranged so as to employ what they have learned in their regular lessons in Form Study and Drawing, the regular instruction will help the free use of drawing in other work, and the free drawing will help the regular instruction.

It is almost universally believed at the present day that education should begin with the concrete and lead toward the abstract. In order to begin with the concrete, the instruction must begin with things which are not only visible, but also actually tangible, to the child. Such objects must be kept within his reach until he has formed fair concepts of them. In the mean time every opportunity must be given him to express those concepts, modeling being the most available means. Drawing comes next as a ready means of expression, which is also a step toward the abstract. Drawing, as the expression of ideas of things, should be used therefore constantly.

Number. — Objects are used to develop ideas of number. Later, the pupils try to express the different combinations in number through examples of their own, which must be spoken or written. If these examples can be illustrated, the expression is less abstract, and hence more real and impressive to the child, than if merely written. If the teacher will simply start this, the pleasure of the children in this mode of expression will be so great that no further stimulus will be needed. This work should be carried on along the general lines of development in Form Study, as there can be no real drawing without a form-idea beneath it.

Geography. — There is no subject more intimately connected with form than geography. It deals with form from its very nature, as it is the study of the surface of the earth with all its diversities. All means of form expression are therefore valuable and necessary adjuncts in the study of geography. Clay and sand modeling, color, and drawing are important means in developing geographic ideas. They appeal directly to the child, and if this work for geographical purposes is made consonant

with the regular work in Form Study and Drawing, it will prove very fruitful in results. The structure of the earth and its various conformations, the causes of day and night, the zones, the seasons, and vegetation will by these means become real, and not mere words.

Language. — Throughout the regular form and drawing work, as laid out in Drawing-Book III. and this Manual, teachers should continue to give pupils practice in the use of terms and names learned in the previous form study, as well as in the use of those given below, always requiring complete sentences.

Names of Models, Objects, and Details.

CYLINDER, SQUARE PRISM.

VASE FORM: profiles.

CURVES: altitude, reversed curves.

LINES: tangential union.

COLOR: olive or violet-green; russet or orange-violet; citrine or orange-green.

Terms of Construction.

FACTS: top view, front view, left-side view, right-side view, end view.

Terms of Representation.

APPEARANCE: the level of the eye, below the level of the eye.

ARRANGEMENT OF A GROUP: unity, variety, repose.

Terms of Decoration.

ORNAMENT: geometric, historic.

REPETITION: horizontal, around a centre; border, rosette, surface covering.

DETAILS: enclosing figure, central figure; oblong quatrefoil.

UNITS: their modification in outline, and in proportion.

BEAUTY: arrangement, proportion, shape, grace of curves.

SUGGESTIONS TO TEACHERS

FOR

THE USE OF THE MANUAL.

THE text for each exercise is divided into three parts, and each part has its special purpose. For the purpose of clear distinction each part is presented in a particular size of type.

For information with regard to the subject and the special topic of the exercise, the matter in large type should be studied. It will be noted that at the close of this part of the text, the special points to be developed with the class are given.

For suggestive methods of developing in the minds of the pupils the ideas of the exercise, the matter in smaller type headed "Study of Models by Pupils" and "Observation Exercise by Pupils" should be studied.

For definite statements as to the drawing to be done, the matter headed "Practice" and "Direction" should be studied.

It is earnestly hoped that teachers will not look upon the manual text either in its Suggestions or its Directions as something to be rigidly followed, but that they will strive to learn and apply the method and spirit of the work in the instruction of their classes. The attention of teachers is especially called to pages 3, 4, and 36, regarding the method and spirit of this work.

NOTE. — As pupils now receive in the first two years of school good instruction in Form-Study and Drawing, guide points and some illustrative diagrams necessary in the early edition of Drawing-Books I. to VI. are omitted in the later edition. It will be necessary, therefore, for teachers to make the slight adaptation in the instructions in the Manuals for the various exercises which is needed to meet the changed conditions. The drill exercises and practice pages, given in the Manuals as preceding the regular exercises, are to be drawn upon practice paper by pupils using the later edition.

BOOK IV.

In Book IV. the exercises are arranged specifically under the three heads, *Construction*, *Representation*, and *Decoration;* and the exercises given under these three heads lead to Working-Drawings and Constructive Design, to Pictorial Drawing and Composition, to the Drawing of Ornament and Decorative Design.

CONSTRUCTION. ***Facts of Form.***
- SOLIDS: Equilateral Triangular Prism, Ellipsoid, Ovoid.
- TABLETS: Triangles, Ellipse, Oval.
- MAKING: Equilateral Triangular Prism. Toy House.

REPRESENTATION. ***Appearance of Form.***
- COVERED BOXES, SLATE, BOOK CLOSED.
- COMPOSITION. Groups of Fruit and Objects.

DECORATION. ***Ornamentation of Form.***
- MOORISH ORNAMENT; ROSETTES.
- DECORATIVE DESIGN. Surface Covering, Natural Growth, Conventionalization, Units from the Bunchberry, Design from the Bunchberry.

Drawing.

Language. — (See page 141.)

Color. — (See pages 139, 140.)

INTRODUCTION.

The Three Subject Divisions of Form Study and Drawing.

THE study of Form and Drawing includes three distinct yet correlated subjects: —

CONSTRUCTION, the science and art of making diagrams or working-drawings, which give the facts of objects, and from which objects may be constructed.

REPRESENTATION, the science and art of delineating or representing objects as they appear to the eye.

DECORATION, the science and art of producing beauty in ornament.

In Books I. and II. these three subjects are equally developed, the exercises having been planned with special reference to Construction, Representation, and Decoration. In Book III. and succeeding books the exercises are designated as belonging respectively to Construction, Representation, or Decoration, and the exercises in the latter part of each book are devoted to a review of the three subjects. The instruction in the Manuals is arranged accordingly.

Care should be taken to have the nature of these three subjects clearly developed in the minds of the pupils; and frequent opportunity should be taken to recall and impress them. Instruction in the three subjects should be as nearly parallel as possible; it would be found a great disadvantage to pursue one of them for six months at a time to the exclusion of the other two.

Plan of the Manuals.

In preparing the Manual Text for the Drawing-Books of Prang's Complete Course, the endeavor has been to meet all conditions. The text under each exercise consists of three parts, the first part relating to the subject-matter necessary for the information of the teacher; the second part relating to the method of developing these ideas in the minds of the children; the third part to specific directions for drawing. The exercises given for "Study of the Model" and for "Observation by the Pupils" are given as suggestions. It is expected that teachers will supplement and vary these exercises by their own skill and tact and through their knowledge of child-nature. If the pupils are beginners in the work, the teacher must be careful to lead them to such observation as will enable them to discover and recognize the leading characteristics of a form or of a detail before giving the name. If pupils have been already prepared in the primary work, the earlier exercises in the Drawing-Book may be treated in part as review exercises by the teacher. A general review of the type forms used in preceding books may be given. For suggestions, see pages 4–11.

Drill Exercises.

Practice Paper. — It is desirable that pupils should have some practice in movement and drawing before beginning work in the Drawing-Book. For this purpose, use sheets of manila practice paper, six by nine inches.* This paper will be found useful for practice previous to many of the exercises throughout the Drawing-Book, as well as for folding. The sheets should be used on both sides for drawing. Provision should be made for from twenty-five to thirty sheets for each pupil for use with one Drawing-Book.

Drill Exercises Necessary. — In order to draw well, two things are necessary, — a knowledge of the thing to be drawn, and skill of hand to draw. Then not only study the object to be drawn, but endeavor also to attain skill of hand through repeated practice.

It is not enough that the mind wills the hand; the muscles must be trained to obey. Hence frequent drill exercises are given to afford practice for proper pencil-holding, free movement, and ready drawing. The teacher should seek to become ready in drawing, and should carry out the exercises given to the pupils.

The first exercises chosen are simply in movement directly *from top to bottom, from left to right,* and also *round and round.* The first steps preparatory to these exercises are very simple; but they are essential to success, and should therefore be practiced with great faithfulness.

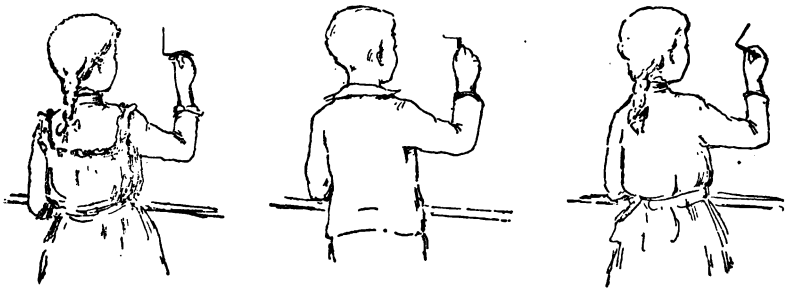
Books and Pencils. — The name of the owner should be carefully written upon each Drawing-Book before the time of the lesson. The books should be placed in piles arranged according to the rows of pupils, to be ready for distribution when desired. The pencils should be sharpened to a blunt point, so that a broad line may be obtained. If the pencils have sharp points, they will make thin, hard, wiry lines, instead of the broad, soft, gray lines which are so much more pleasing.

Pencil-holding. — Before beginning work on the paper, give practice in pencil-holding. Let a monitor for each row place a pencil in the groove of each desk in the row, taking care to have each pencil point toward the left. Then give exercises as follows in taking up the pencil and in holding it properly: Hold up the left hand; take your pencil near the point with the thumb and first two fingers of the left hand; place the pencil between the thumb and first two fingers of the right hand, letting these grasp the pencil lightly near the middle. Thus the pencil will be quickly placed in the hand, and long pencil-holding will be

* The paper is put up in packages of one hundred sheets, and may be obtained of booksellers and of The Prang Educational Company.

insured. It will be well to have pupils lay down and take up their pencils together three or four times, so that the manner of doing may be well understood.

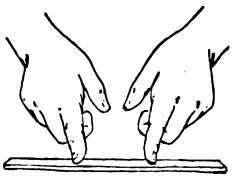
Movement for Straight Lines. — Free work both in movement and in drawing is of the greatest importance; for drawing, to be valuable, must be free and ready. Give practice in movement with the pencil from back to front on the desk; and see that *each pupil* holds the pencil at an angle of about 30° to the desk, and pointing directly to the left (see Fig. 1, page xii); the same for movement from left to right, the pencil at an angle of about 30°, and pointing toward the back of the desk (see Fig. 2, page xii); and from corner to corner (see Figs. 3 and 4, page xii). To keep the children together, for movement count as follows: One, back; two, back; three, back. Endeavor to make the whole movement continuous, unbroken; therefore count in even time.

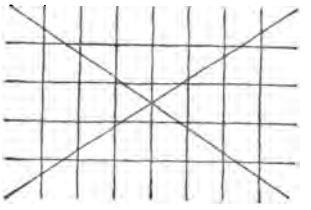


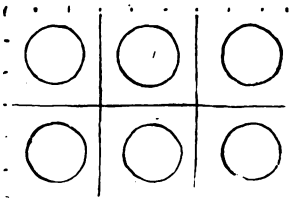
These illustrations show drawing at the board, with the crayon held properly with relation to the line to be drawn.

Practice. — The practice paper may now be distributed, and the paper placed in front of the pupil, with long edges from left to right. Each pupil may place a point that shall be one inch from the upper edge and one inch from the left edge. Beginning at this point, lines an inch apart, and ending an inch from the lower edge, may be drawn down the paper at the count of the teacher, movement being practiced first. When counting for movement for straight lines and drawing combined, count as follows: One, back; two, back; three, ready; draw. The movement may be made as many times as seems desirable, — generally not less than two nor more than five times before drawing, — but the word for the last movement back should be *ready*, that pupils may be prepared to draw. Beginning at the first point, lines one inch apart, and ending an inch from the right edge of the paper, may be drawn across the paper at the count of the teacher, movement being practiced first. Beginning at the first point again, a line may be drawn in a similar way to the lower left corner; and beginning at the upper right corner, a line may be drawn to the lower left corner. See illustration, page 85.

Movement for Circles. — Give directions for holding the pencil for movement round and round with the pencil pointing toward the left, as for a vertical line, and for practicing the movement on the desk (see Fig. 5, page xiii). The pencil must be held the same throughout the movement. Count, One, two, three, four, etc., counting but *one* for each circular movement. For the last complete movement before drawing, say *ready*. The counting will then be, One, two, three, ready, draw. After practicing the movement on the desk, pupils may take the paper, bisect the left edge, and trisect the upper edge, using the fingers, as shown in the illustration, or a finger and a pencil. From the points of trisection, verticals may be drawn down the paper, and from the point of bisection, a horizontal may be drawn across the paper at the count of the teacher. In each space a circle may be drawn at the count of the teacher, special attention being given to pencil-holding and to free movement. Illustrations of these two exercises are given below.







Quality of Line. — It is desirable that the line in this work should be, as a rule, broad, soft, and gray, instead of thin, wiry, and black. The texture should be open and transparent. To secure this, the line should be made with light pressure, using rather a soft pencil. There will then be little spaces between the particles of lead which make the line, giving it openness and transparency.

Length of Exercise. — As the purpose of the drill exercises is to give practice in free movement and ready drawing, it would be a great mistake to make these exercises long. No drill exercise should occupy ten minutes, and the best results in the end will be reached if not more than five minutes are spent. The children will soon become anxious to produce good work in the shortest space of time

Order of Class Work.

I. Form Study by Pupils.
II. Position of Book, of Class.
III. Pencil-Holding.
IV. Drawing of Construction Lines. — Class Exercise.
V. Drawing Outlines. Individual Exercise.
VI. Use of Eraser.
VII. Finishing the Drawing.

Details of Work.

I. In Construction and in Representation, teachers should lead pupils to study models or objects; in Decoration, to study arrangement and examples of ornament.
II. Pupils place their books with long edges parallel to the front of the desk, but pushed well back; they take pencils and positions for drawing the construction lines, sitting upright.
III. They hold pencils long and place them at right angles to the line to be drawn.
IV. They draw all construction lines continuously, without stopping and at the word of the teacher; one line being drawn, all lines parallel to that line are next drawn. Light work. Corrections made with the pencil, but no erasing.
V. The outlines desired are then drawn, each pupil practicing and drawing by himself.
VI. Pencils are then placed on the desk, the eraser is taken for the first time and used in erasing superfluous and incorrect lines.
VII. The eraser having been used, it is put aside, and pencils again taken to finish the work.

There are some exercises in which all these details will not be found applicable, but they show the general plan to be pursued.

CHAPTER I.

CONSTRUCTION;

Or, Drawing as Applied in Conveying Ideas of the Facts of Objects.

THE general character of the subject of Construction is stated on page 15. In Book III. the models and objects selected for constructive work are such as offer the fewest difficulties to the beginner, the views chosen being those obtained under very simple conditions.

In Book IV. a step in advance is taken. Models are presented which involve views of foreshortened faces, as the equilateral triangular prism and the toy house. As the foreshortening is not always fully comprehended at once, much stress is laid on its study in this book. Teachers should be careful to lead pupils to a clear perception of the results of foreshortening through a variety of exercises.

EXERCISE I. — Equilateral Triangular Prism. — Drawing the Pattern.

MODELS: *Square and Equilateral Triangular Prisms, Square and Equilateral Triangle.*

OBJECT. To study the form of an equilateral triangular prism; to study the shape of an equilateral triangle; to draw the pattern of an equilateral triangular prism; to make the model.

A Prism. — A prism is a solid having two equal faces parallel to each other, called bases, including between them as many square or oblong faces as the bases have sides. A prism is named from the shape of the two equal faces or bases. These faces are called bases because the prism rests upon one of them when in its normal or vertical position.

Square Prism. — The square prism is a solid having six plane faces, two of them being equal square faces parallel to each other; its four other faces being equal and its opposite faces parallel. It is called a square prism from its two equal square faces or bases. When the term square prism is used, it is generally taken to mean a solid which is higher than wide; but a cube (in which the height equals the width) is also a square prism; and a square plinth (in which the height is less than the width) is a square prism. All these have two equal square faces parallel to each other and four other equal faces, the opposite faces being parallel.

Right-Angled Triangular Prism. — If the vertical square prism is bisected vertically through the diagonal of its top face, two new prisms result having right-angled triangular bases; they are therefore called right-angled triangular prisms.

This name is long, and it may be abbreviated to right-angled tri. prism, but it will not do to call it a right tri. prism. A right prism is any prism that has its axis perpendicular to its bases, Fig. 1.; it is called a right prism to distinguish it from a prism having its axis oblique to its bases, Fig. 2. The name right tri. prism means, therefore, simply a triangular prism whose axis is perpendicular to its bases, and it does not imply that its bases are right-angled triangles. The prisms studied in these early exercises are all right prisms. An application of the right-angled triangular prism is given in Exercise XVI. This is frequently observed in roofs.

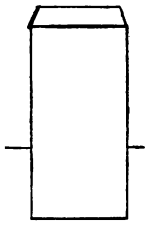


Fig. 1.

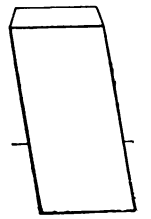


Fig. 2.

Equilateral Triangular Prism. — There are also other triangular prisms named according to their bases. The prism chosen for study in this exercise is the equilateral triangular prism (equi. tri. prism), so named from its bases, which are equilateral triangles. It has five faces, two triangular and three oblong faces.

Illustrations are given here (for the teacher's use) of the three kinds of triangles named from the relative length of their sides. Fig. 1, an equilateral triangle, the three sides being equal; Fig. 2, an isosceles triangle, having two equal sides; Fig. 3, a scalene triangle, having none of its sides equal.

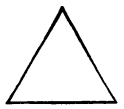


Fig. 1.

Fig. 2.

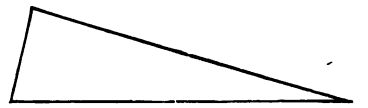


Fig. 3.

Drill Exercises. — Two drill exercises are given on page 89 for Drawing-Book, page 1, either of which may be given at the discretion of the teacher. If the pupils have had a good deal of previous drill, the second is recommended. If the second is given, it can, when completed, be used for a review of square, oblong, rhombus, etc. (see page 53), triangles, and angles.

These exercises are given for the sake of the practice in pencil-holding, free movement, direction, and drawing straight lines needed before drawing pages 2 and 3. A drill exercise should not occupy ten minutes.

To be developed. — Form of model; use of names, equilateral triangle, equilateral triangular prism; pattern of equilateral triangular prism; making hollow equilateral triangular prism; accuracy.

Suggestions for the study of the Model by Pupils. — Place the square prism and equilateral triangular prism upright and facing you. How do these two models resemble each other? (*They are each twice as high as wide.*) In what other way do they resemble

each other? (*In each model, the ends are parallel to each other and just alike; the faces between the ends are oblongs.*) What name could be given to both models? (*The name* **prism** *could be given to both models.*)

The prisms are standing upright; upon what part does each stand? (*Each prism stands on the end.*) The part on which a solid rests is called its **base**; as a prism can stand upon one end as well as upon the other, each end is called a base. (The teacher develops the name *square prism* from the shape of its bases; also **triangle** and **triangular prism** through comparison of the bases of the two prisms, and of the corresponding tablets; and **equilateral triangle** and **equilateral triangular prism** by study of the tablet and the prism and other triangles cut from paper.)

Working out the Pattern from the Model. — (The teacher also recalls or develops the idea of a pattern, as suggested on pages 23–25.) How many faces has the equilateral triangular prism? What is the shape of each face? What is a triangle? (*A triangle is a figure having three sides and three angles.*)

What is an equilateral triangle? (*An equilateral triangle is a triangle having equal sides and equal angles.*) Find two among the tablets; how does the height compare with the length of the sides? What is an oblong? (*An oblong is a figure having four straight sides and four right angles, with only its opposite sides equal.*) Of what figures would you make the pattern of this equilateral triangular prism? (*I would make it of three oblongs and two equilateral triangles.*)

Drawing-Book, *page 2.* — Drawing the Pattern.

Observation Exercises for Pupils. — What is Fig. 1? Fig. 2? Fig. 3? Having the length of an oblong face of an equilateral triangular prism twice as high as wide given, how would you draw the pattern?

Drawing-Book, *page 1.* — Drill Exercise. Practice for Exercise I.

Observation Exercise for Pupils. — How far is it between the points on page 1? How many inches are there between *o* and 8? How many inches are there between *o* and *e*? If you bisect an inch, what do you obtain?

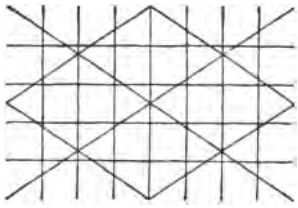
Practice. — **Drill Exercise 1.** — Draw verticals from 1, 2, 3, 4, 5, 6, 7, ending these lines directly opposite *e*. Draw horizontals from *a*, *b*, *c*, *d*, ending these lines directly below 8. Make a point two inches and a half below *o*, and mark it *f*; make another two inches and a half below 8, and mark it *g*. Find the vertical from 4, and mark its lower end *h*. Place a point for a lower right-hand corner opposite *e*, and mark it *i*.

Draw *f* 4, *e* 8, and *h g*; draw *f h*, *o i*, 4 *g*.

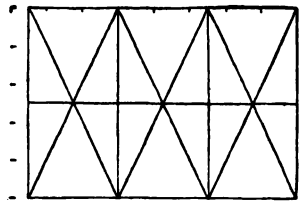
Practice arm movement for each line before drawing. *No erasing.*

Practice. — **Drill Exercise 2.** — Make a light point half an inch to the right of *o*, and another five inches and a half to the right of *o*; mark these points *r* and *s*. From the points *r*, 3, *s*, and 8 draw verticals, ending these lines directly opposite *e*. Mark the lower ends of these lines *t*, *u*, *v*, *w*. Make a point two inches and a half down from *o*. Beginning half an inch to the right of this point, draw a horizontal to meet the line 8 *w*. Draw oblique lines, 3 *t*, *s u*, 8 *v*; then draw oblique lines, *r u*, 3 *v*, *s w*.

Drill Exercise 1.



Drill Exercise 2.

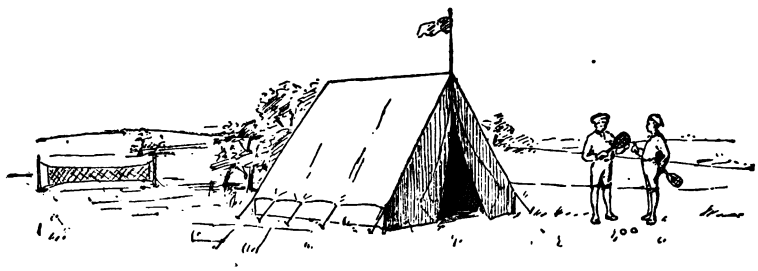


Suggestions for two exercises for Drawing-Book, page 1.

Directions, page 2. — The two printed angles show the length of an oblong face. Draw a horizontal to connect the angles. Draw an indefinite vertical from each end of the horizontal. Bisect the horizontal. Point off on the left vertical three distances equal to half the horizontal, and from the points draw horizontals. Complete as in Fig. 1, finishing the triangles and oblongs in broad lines.

Prang's Pattern Sheet, No. 8. — Making a hollow Equilateral Triangular Prism.

What is printed on this sheet? (*The pattern of an equilateral triangular prism is printed on this sheet.*) Cut out the pattern, taking care not to cut off the laps. Write your name neatly on an oblong face. Fold the pattern so as to make an equilateral triangular prism, and paste it together.



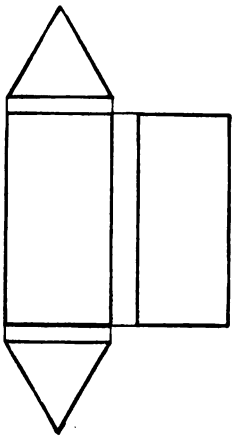
EXERCISE II.—Equilateral Triangular Prism.—1. Facing.—2. Two Oblong Faces turned equally away.

MODELS: ***Square and Equilateral Triangular Prisms.***

OBJECT. To study different views of a vertical equilateral triangular prism, both facing and with two oblong faces turned equally away; to draw the front, top, and side views.

Equilateral Triangular Prism, Facing.—A model is said to be **facing** when it is placed in a normal position and so that a whole face is in view without foreshortening. The term *facing* cannot be applied to a sphere, ellipsoid, ovoid, hemisphere on its base or inverted, vertical cylinder, cone, or vase form.

For this exercise, a vertical equilateral triangular prism is placed facing, and its front, top, and side views are to be studied and drawn. The front view is an oblong twice as high as wide. Look now at the top view; it is an equilateral triangle. The upper edge of the front is the base of the triangle; as the vertex of the triangle points away from the front. In drawing the top view, the relative position of the vertex of the triangle must be remembered. Having drawn the front view, draw the top view a short distance above it, the vertex pointing upward. Observe the bottom view; you see again an equilateral triangle with the vertex pointing away from the front face. Draw the bottom view as far below the front view as the top view is drawn above the front view. The bottom view will be an equilateral triangle inverted, that is, with the vertex pointing downward and away from the front view.

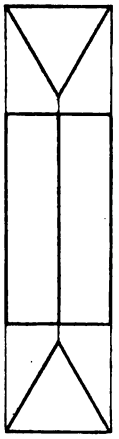


Keep the equilateral triangular prism vertical and facing, and look at the right side view. In order to see the right side view, you must look at the model from the right side in a direction exactly at right angles to the direction in which you looked at the front view. You will then see that the right side view cannot be wider than the width of the top face from *back to front*, and must therefore be a *narrower* oblong than the front view, and not as wide as the right side *face*. The side face is foreshortened.

If this is not quite clear to you, place a card horizontal from left to right against the front face of the prism and extending to the right. Place another card parallel to the first, against the back edge of the prism and extending to the right. You thus have a passage-way along which the prism might be moved back and forth. Notice

the width from front to back of this passage way; this width shows what the width of the right side view must be. Try to make clear in your mind the distinction between the right side view and the right face of the equilateral triangular prism. The right face is really as wide as the front face; but as it stands obliquely to the direction in which you must look, which is *directly* from right to left, it appears **foreshortened.**

Equilateral Triangular Prism with an Edge toward you. — The equilateral triangular prism is still vertical, but it is now placed so that two faces are evenly turned away from you, thus bringing an edge toward you. Look at the top view; it is an equilateral triangle with the vertex toward you and hence toward the front view. Raise the prism opposite the eye so as to have the front view; it is as wide as the further side of the triangle, and you see three vertical edges. The upper edges of the two faces visible are on the same level, and so are the lower edges of these faces. The front view is a vertical oblong as wide as one side of the triangular base, and having a central vertical line. Look at the bottom view; it is an equilateral triangle with the vertex pointing toward the front view.



The form of the equilateral triangular prism, as well as of the isosceles and the right-angled triangular prism, is found among prisms used for the decomposition of light.

Working-lines, or transferring lines. By means of these lines distances are transferred from one view to another, and they are used a great deal in elementary practice. Formerly these working-lines were all drawn as dotted lines; but of late years the conviction is growing that the dotted lines are a waste of time, as light lines answer the same purpose. One view having been drawn, as the front view of the equi. tri. prism in this exercise, light indefinite lines are drawn from the upper and lower right corners to the right, so as to carry or transfer the height of the front view to the place where the side view is to be drawn. Thus the height of the side view is easily obtained.

The illustration on page 20 shows the use of working-lines, which are there dotted, to show the practice of some draughtsmen.

To be developed. — **Top, front, and side views of vertical equilateral triangular prism, (1) facing, (2) two oblong faces turned equally away; working or transferring lines; quality of line.**

Suggestions for the Study of the Model by Pupils. — Place the square and the equilateral triangular prisms vertical and facing you. What is toward you? (*A face is toward me.*) Place them so that two faces of each are turned evenly away from you.

What is toward you? (*An edge is toward me.*) How wide does the square prism look from left to right? (*The square prism looks as wide from left to right as a diagonal of its top face.*) How wide does the equilateral triangular prism look from left to right? (*The equilateral triangular prism looks as wide from left to right as the further edge of the top face.*)

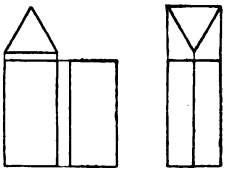
Look at the top view; what would you draw for the top view? (*I would draw an equilateral triangle inverted, with the base at the top and the vertex pointing downward.*) Why would you have the vertex point downward? (*Because the vertex points toward the front in the model. The front view must be below the top view and so the vertex in the top view must point downward.*) How many vertical edges do you see in the front view? (*I see three vertical edges in the front view.*) What would you draw for the front view? (*I would draw two horizontal and three vertical lines, making the vertical lines under the angles of the triangle.*) In this drawing of the front view of the equilateral triangular prism, what would these lines form? (*They would form a vertical oblong with a line through the centre under the middle angle of the triangle.*)

Drawing-Book, *page 3.* — Drawing views of an Equilateral Triangular Prism, facing and turned.

Observation Exercise by Pupils. — What do you see upon Drawing-Book, page 3? Place your equilateral triangular prism so that the top view looks like the first triangle. How have you placed it? (*I have placed it vertical and facing me.*) Place it so that the top view looks like the second triangle on the page. How have you placed it? (*I have placed it vertical with an edge toward me.*)

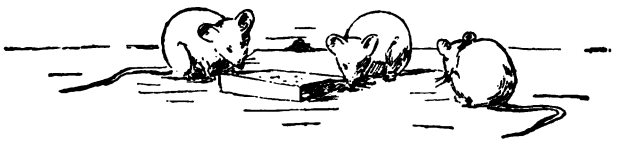
Directions. — The triangle printed at the left shows the top view of a vertical equilateral triangular prism facing you. Below it draw the front view of the prism, drawing light working lines down from the top view. Draw the right side view, drawing light working lines across from the front view.

The triangle printed at the right shows the top view of a vertical equilateral triangular prism with an edge toward you. Draw the front view of the prism, drawing light working lines down from the three angles of the triangle. Complete the front view.



Drawing-Book, page 3, completed.

Finish the views of the prism, facing and turned, in broad gray lines, leaving the working lines light.



EXERCISE III. — Ellipsoid. — Four Views.

MODELS: *Sphere, Ellipsoid, Circle, Ellipse.*

OBJECT. To study the form of an ellipsoid; to see four views; to draw three views.

The Ellipsoid. — This is a model somewhat like the sphere, and it should be studied by contrast with the sphere. They are both pleasant to hold. The surface of each is unbroken by an edge, therefore each solid has but one face. The sphere, however, measures alike from top to bottom, from left to right, and from back to front; the ellipsoid held vertically measures the same from left to right and from back to front, but its height is greater than its width.

The sphere is beautiful in its perfect roundness, but in the ellipsoid we find another element, that of proportion of unequal parts. It is longer than it is wide, consequently its surface differs from that of a sphere. The surface of a sphere is round; that of an ellipsoid is called rounding. Try to roll the ellipsoid; you will find that it will roll easily back and forth if placed horizontally; but if you wish to change its course, you must turn it a little. If you place it in a vertical position on the table, and give it a little impetus, it will roll spasmodically.

We find that many things which are pleasant to eat and pleasant to see have this form, — fruits, as lemons, plums, barberries, gooseberries, Malaga grapes, etc.; the garden seed-holders, as cucumbers, watermelons, muskmelons, etc.; nuts, as pecan nuts, English walnuts, butternuts, etc. The cocoons of insects have this form.

Its Outline and Views. — In whatever position you may hold the sphere, its outline will appear the same; but the ellipsoid has many different outlines. Hold it vertical; its outline is an ellipse. Tip it toward you; its outline is a shorter ellipse. Tip it still more, so that its long axis is horizontal from back to front; its outline is a circle.

Hold it vertical again. Its front view is an ellipse; its left side view is an ellipse; its right side view is an ellipse; its top view is a circle, having a diameter equal to the width of the vertical ellipsoid; its bottom view is a circle of the same size.

The Ellipse. — This figure varies from the circle just as the ellipsoid varies from the sphere. A circle may have any number of diameters; but all will be of the same length. An ellipse has but two diameters, one measuring the longer dimension of the figure, the other the shorter dimension; these are called the long and short diameters. The shape of the ellipse varies according to the proportion of these diameters.

It is a very beautiful figure, as it adds the element of proportion to curvature in the outline. One of the most perfect examples is found in that conic section made by cutting a cone in a direction oblique to its axis.

The ellipse is found in many leaf shapes; it is also a favorite shape for shallow pieces of pottery. An elliptical outline is found in dishes, platters, mats, trays, etc.

In drawing the vertical ellipse, hold the pencil as for a vertical line.

Color. — In this exercise, the transferring lines for the left side view are to be omitted. The outline of the ellipsoid having been brought out as an ellipse in the drawing of the left and right side views, an ellipse is to be cut from colored paper and pasted over the drawing at the left. See Color, pages 72–75, 139, 140.

The addition of the colored ellipse to this page will greatly increase the pleasure and interest of the pupils in their work. Color appeals so strongly to all that its use should always be encouraged and definite provision made for it when possible. It not only enables pupils to appreciate their environment but may be made a powerful means in awakening and cultivating the sense of the beautiful.

Drill Exercise. — This exercise is given for the sake of the practice in circles needed for drawing the top views of the ellipsoid and ovoid.

To be developed. — Form of model; use of name ellipsoid; rounding surface; one face; facts of model, its appearance, its beauty; outline, an ellipse; free movement; quality of line.

Suggestions for the Study of the Model by Pupils. — (The sphere and ellipsoid presented.) Take the two models. How does the new model resemble the sphere? How does it differ from the sphere? What kind of surface has it? (*It has a rounding surface.*) How many faces has it? (*It has one face.*) What is it called? (*It is called an ellipsoid.*)

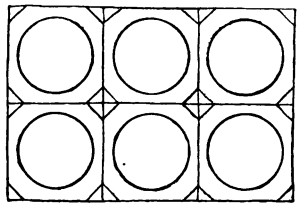
Hold the ellipsoid vertical. Trace on the model the outline of the part that you see. Find or cut a tablet having the shape of the outline. Hold the tablet vertical, facing you; how do its vertical and horizontal diameters compare? (*The vertical diameter is longer than the horizontal diameter.*) Compare the curve of the outline at the ends of the vertical diameter with the curve of the outline at the ends of the horizontal diameter; can you describe the curve? What is this figure called? (*It is called an* **ellipse.**) Hold the ellipsoid vertical again. How does the outline differ from that of the sphere? Tip it toward you a little. Trace its outline. Tip it toward you until the long axis of the ellipsoid is horizontal from back to front; trace its outline, — trace at its greatest width. Hold it vertical again; what would you draw for its front view? (*I would draw an ellipse.*) What would you draw for its top view? (*I would draw a circle.*) How wide is the top view? (*The top view is just as wide as the front view.*) What would you draw for its left side view? What would you draw for its right side view? What can you think of that is like an ellipsoid?

Drawing-Book, *page 5.* — Drawing three Views of an Ellipsoid.

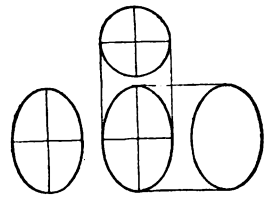
Observation Exercise for Pupils. — What do you see on the page? What are you to do? How can you get the curve of the ellipse? (*I can get the curve by practicing movement.*)

Drawing-Book, *page 4.* — Drill Exercise. Practice for Exercise III.

Practice. — Free movement, free drawing. Draw an oblong, using the angles given, — first the verticals, then the horizontals. Trisect the upper side; from the points of trisection draw verticals down the oblong. Bisect the left side; from the point of bisection draw a horizontal across the oblong, making 6 squares. In each square draw a circle about 2 inches in diameter. Finish, as in the illustration of the page completed, by drawing at each intersection of the dividing lines a square on its corner, having a diagonal of 1 inch (the point of intersection being the centre of the square), a half square at each end of each dividing line, and a quarter square at each corner of the oblong.



Drawing-Book, page 4, completed.



Drawing-Book, page 5, completed.

Directions, page 5. — The front view of an ellipsoid is given; the left, top, and right views are required. Draw first the top view. Its centre is given; fix the width of the top view and the place of its vertical diameter, draw three indefinite verticals, practicing movement upward from the front view and drawing downward. Draw the horizontal diameter and fix the length of the vertical diameter. Practice movement for a circle and draw the top view at one sweep.

The diameters are printed for the left side view. Practice the movement for an ellipse on the front view, and over the given diameters; then draw the left side view. For the right side view draw light horizontals from the top and bottom of the front view. Practice the movement for an ellipse on the front view, then draw the right side view.

Cut an ellipse from colored paper of the size and proportion of the front view, and paste over the left side view.

EXERCISE IV.—Ovoid.—Four Views.

MODELS: ***Ellipsoid, Ovoid, Ellipse, Oval.***

OBJECT. To study the form of an ovoid; to see four views; to draw three views.

The Ovoid. — This form must be studied in contrast with the ellipsoid. The sphere is pleasant to hold in the hand but pleasanter still to roll in any direction; the hand grasps the ellipsoid comfortably and it rolls back and forth, but a little unsteadily; but the ovoid nestles with comfort in the hand as if recognizing its home and in rolling, it describes a circle as if completing the circuit of life.

The surface of the ovoid is unbroken by an edge; therefore, like the sphere and the ellipsoid, it has but one face, only half of which can be seen at one time. These three models differ however as to their axes; the sphere has any number of axes, the ellipsoid (vertical) has one vertical axis and any number of horizontal axes; the ovoid has but one axis.

But the element of proportion seen in the ellipsoid assumes a higher character in the ovoid. Hold the ellipsoid in a vertical position; the proportion lies in the relation between the height and the width. In the ovoid, the proportion lies not only in the relation between the height and the greatest width but also in the axial proportion; that is, the relation between the part above and that below the greatest width. The ovoid, when in its normal position, has its axis vertical, and its greatest width nearer the upper than the lower end of the axis. The upper part of the ovoid resembles the sphere, and the lower part resembles the ellipsoid.

The ovoid is found in a great number of natural forms, — in buds of flowers, in hops; in fruit, as plums, pears, strawberries, figs, pineapples (and these you notice are of most delicious flavor); in vegetables, as egg-plant; in nuts, as acorns, hazelnuts, etc.; in seed-vessels, as the poppy, the rose-hip, etc.; in the bodies of many animals; in the bodies of birds as well as in their eggs; in the bodies of insects; in the human head. In manufactured objects, there are jars and vases of infinite variety based on the ovoid.

Its Outline and Views. — The ovoid, like the ellipsoid, has many different outlines, varying according to the position in which it is viewed. Hold it vertical; its outline is an oval. Tip it toward you somewhat; its outline is a shorter oval. Tip it still more, so that its axis is horizontal from back to front; its outline is a circle.

Hold it vertical again. Its front view is an oval; its left side view is an oval; its right side view is an oval; its top view is a circle, having a diameter equal to the width of the ovoid; its bottom view is a circle of the same diameter. For although

the lower part of the ovoid is smaller than the upper, yet if you look at the bottom view (holding the ovoid directly over your head and looking upward), you will find its greatest width equal to the greatest width of the top view.

The Oval. — The ellipse has two diameters, the long and the short diameter, and either diameter is an axis of symmetry. The oval has one diameter, better called an axis of symmetry. The oval is found in many leaf shapes, also in the petals of flowers; a palette has often an oval shape. In drawing the oval, hold the pencil as if for a vertical line.

Transferring Lines. — In this exercise, the transferring lines for the left side view are to be omitted. The outline of the ovoid having been brought out as an oval in the drawing of the left and right side views, an oval is to be cut from colored paper and pasted over the drawing at the left. See Color, pages 72–75, 139, 140.

To be developed. — Form of model; use of name ovoid; rounding surface, one face; facts and appearance of model; symmetry, proportion, beauty; normal position; outline, oval; free movement; quality of line.

Suggestions for Study of the Model by Pupils. — (The ellipsoid and ovoid presented.) Take the two models. How does the new model resemble the ellipsoid? How does it differ from the ellipsoid? What kind of surface has it? (*It has a rounding surface.*) How many faces has it? (*It has one face.*) What is it called? (*It is called an ovoid.*) Which end should be at the top in the vertical ovoid? (*The larger end should be at the top.*) Trace the outline of the vertical ovoid in the air.

Find a tablet having the shape of the outline. Hold it vertical, facing you. Look at the curves of the outline at the top and bottom and at the sides; can you describe the curves?

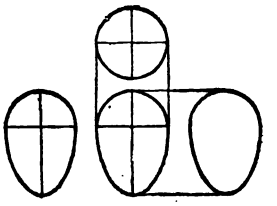
This figure is called an **oval.** Where is the widest part of a vertical ellipse? of a vertical oval?

Hold the ovoid vertical again. Trace its outline. Tip it toward you a little. Tip it toward you until the axis of the ovoid is horizontal from back to front; trace its outline at its greatest width. Hold it vertical again; what would you draw for its front view? (*I would draw an oval.*) Where is the greatest width of the front view? (*It is nearer the top than the bottom.*) What would you draw for its top view? (*I would draw a circle.*) How wide is the top view? (*The top view is just as wide as the front view.*) How wide is the bottom view? (*The bottom view is just as wide as the top view.*) What would you draw for the left side view of the ovoid? What would you draw for its right side view? What can you think of that is like an ovoid?

Drawing-Book, *page 6.*— Drawing three Views of an Ovoid.

Observation Exercise for Pupils. — What do you see upon the page? What are you to do? How do the upper and lower part of an ovoid compare? How do the upper and lower part of an oval compare?

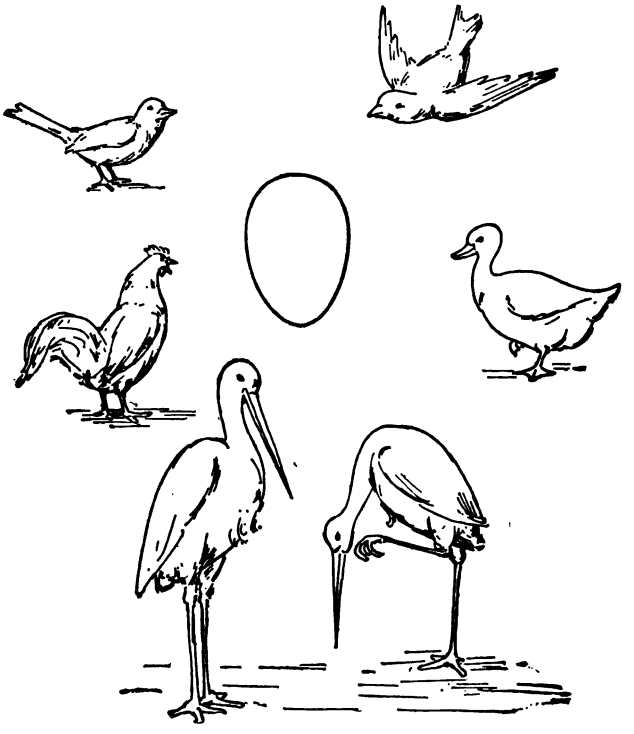
Directions. — The front view of an ovoid is given; the left, top, and right views are required. Draw first the top view. Its centre is given; fix its width and the place of its vertical diameter; draw three indefinite verticals, practicing movement upward from the front view and drawing downward with free movement.



Drawing-Book, page 6, completed.

Draw the horizontal diameter, and fix the length of the vertical diameter for the top view. Practice movement for a circle, and draw the top view at one sweep. Construction lines are printed for the left side view. Practice the movement for an oval on the front view and over the given lines; then draw the left side view. For the right side view, draw light horizontals from the top and bottom of the front view. Practice movement for an oval on the front view; then draw the right side view.

Cut an oval of the size and proportion of the front view from colored paper, and paste over the left side view.



EXERCISE V. — Ellipsoid. — Two Views.

MODELS: ***Sphere, Ellipsoid, Circle, Ellipse.***

OBJECT. To study the form of an ellipsoid; to see and to draw two views.

Additional Study. — As the pupils have studied to some degree the ellipsoid and ovoid in contrast, they will now be able with further study to attain a better idea of their form, and consequently to express it better by drawing. In working out these exercises, always do your best, — do not attempt the drawing without preliminary study of the model; and if your drawing is poor, study the model again. As your mental image of the form grows, your power of expressing the form will grow. Do not think, therefore, that the study that has already been given is sufficient. Give the models to the children again before asking them to draw the exercise. Call out the imagination to enliven the work and to put new spirit into it.

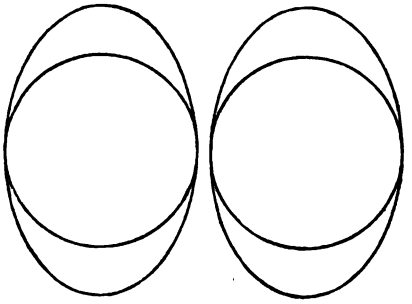
The Ellipsoid. — Take your sphere; compare the upper half and the lower half, the left half and the right half, the front half and the back half; each half is not only like its mate, but is also like every one of the other possible halves. Hold your ellipsoid vertical; the upper half is like the lower half, but is not like either the front half or the back half, the left half or the right half.

Study the proportion of the ellipsoid; its proportion is as 2 to 3. See how this change in proportion changes the character of the surface and the curvature of the outline. Try to express this change by tracing, in the air, first the outline of the sphere, then of the vertical ellipsoid, then of the ellipsoid with its long axis horizontal from left to right. The curve in the first case goes round and round, in the second and third cases it is elongated but still sweeps round.

To be developed. — **More perfect conception of the form and beauty of the ellipsoid; objects like ellipsoid; free movement; quality of line.**

Suggestions for the Study of the Models by Pupils. — Hold the sphere in one hand, the ellipsoid in the other, and shut your hands. Hold up the hand that has the round model; the hand that has the long rounding model. Study the proportion of width to height of the ellipsoid; what is the proportion? How does the curve of the outline of the ellipsoid differ from that of the sphere? Raise both hands as I do; show me in the air, moving both hands, the shape of the outline of the sphere. Show me in the air the shape of the outline of the vertical ellipsoid, of the ellipsoid with its long axis horizontal from left to right.

Can you think of a glass sphere? Who ever saw one? Can you think of a glass eliipsoid? Try to imagine a glass sphere inside the glass ellipsoid; can you see it? Do you think you could show their outlines in the air with both hands? Trace for the sphere first, and as you complete the outline of the sphere pass right on into the outline of the ellipsoid. Place the ellipsoid with the long axis horizontal from back to front. What is its front view? What is the front view of a vertical ellipsoid? What is the top view? How does the curve of the ellipse differ from that of the circle?



Drawing-Book, *page 7.* — Drawing two views of an Ellipsoid.

Observation Exercise for Pupils. — Where is the upper left hand corner of the page? What is the picture there? Why do you suppose that picture is there? Who can think of anything iike an ellipsoid that grows on a tree or on a bush? Who can think of anything like an ellipsoid that grows in a vegetable garden? Who can think of anything that is very good to eat and like a large ellipsoid? We will set the table; what can we have on it that is like an ellipse or an ellipsoid?

Directions. — Draw the front view of an ellipsoid, first practicing movement. Draw three indefinite verticals, practicing movement upward from the front view and drawing downward. Draw the top view. Finish the circle and ellipse in broad, gray lines.

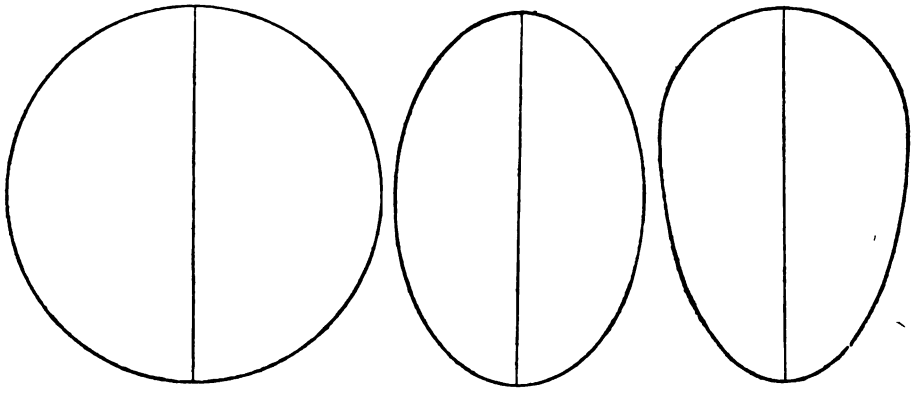
EXERCISE VI. — Ovoid. — Three Views.

MODELS: *Ellipsoid, Ovoid, Ellipse, Oval.*

OBJECT. To study the form of an ovoid; to see and to draw two views of an ovoid.

The Ovoid. — As the curvature and proportion of the ellipsoid is more subtile than that of the sphere, so the proportion and curvature of the ovoid is much more subtile and beautiful than that of the ellipsoid. The ellipsoid has its greatest width at the centre; the ovoid has its greatest width above the centre. This removal of the greatest width from the centre produces a wonderful result, giving us the combination of the round surface of the sphere with the more varied and rounding surface of the ellipsoid. Thus the ovoid is the "mediation" between the sphere and the ellipsoid. The outline of the oval shows one of the most beautiful of curves. Take the ellipsoid and ovoid; pass the fingers gently again and again over the surface of each, endeavoring to feel and see the curvature and make it your own, and you will begin to know of the beauty of the ovoid.

The change in curvature of outline from the sphere to the ovoid is illustrated below, — the full, round curve of the circle; the curve of the ellipse, changing more gently at the sides, more quickly at the top and bottom, thus bringing into its curvature that element of proportion which also lies in its dimensions; the curve of the oval, combining and uniting the beauties of both, thus giving double beauty in itself, its symmetry and its proportion mutually enhancing each other. You will find it a great pleasure to trace these succeeding and contrasting curves by movement in the air, thus adding to and strengthening the thought.



These curves were brought into and are expressive of the life of those two great ancient nations, the Greeks and Romans. The Greeks, seeking for æsthetic form,

chose and developed the ellipsoid and ovoid, using their forms and outlines in their decoration, in their mouldings, and most notably in their beautiful vases. The imperious Romans, seeking for power, reflected their own centralization in their use of the circular curve and outline in their ground-plans, their arches, and their domes, as well as in their mouldings and their decoration.

To be developed. — More perfect conception of the form and beauty of the ovoid; objects like the ovoid; free movement; quality of line.

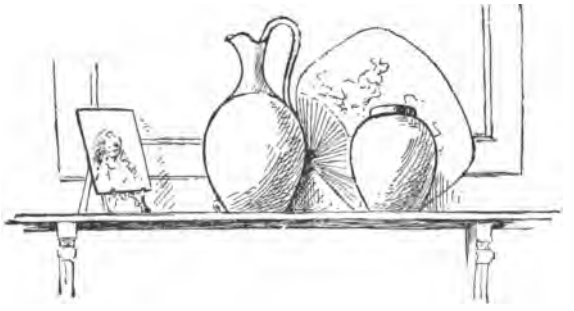
Suggestions for the Study of the Model by Pupils. — (Ellipsoid and ovoid used.) Shut your eyes; take one model in one hand, and one in the other. Are they alike? Can you name either one without looking at it? Hold up the ellipsoid. How does the ovoid differ from the ellipsoid? In what way is it like the ellipsoid? Hold the two models vertical. What is the proportion of the width to the height of the ellipsoid? of the ovoid? Which end should be at the top in the vertical ovoid? (*The larger end should be at the top.*) Trace the outline of the vertical ovoid in the air. Notice the beauty of the form, produced by the subtile changes in curvature and by the contrast between the upper and lower part.

Drawing-Book, *page 7.* — Drawing Two Views of the Ovoid.

Observation Exercises for Pupils. — What does the picture in the drawing-book represent? Do you know the story of Columbus and the egg? Upon which end did he make the egg stand?

Can you think of any objects like an ovoid?

Directions. — The front view of a vertical ovoid is given, also a point for the centre of the top view, and for the diameter of the right side view. Draw the top and right side views, getting dimensions as far as possible by movement from the front view; and finish the top and right side views in broad lines.



EXERCISE VII. — Equilateral Triangular Prism. — Three Views.

MODEL: *Equilateral Triangular Prism.*

OBJECT. To study three views of the horizontal equilateral triangular prism; to draw the end, front, and top views.

Equilateral Triangular Prism. — This model is now taken in a position differing from that given in Exercise II., but involving the same thought. The equilateral triangular prism has three oblong faces and two triangular ends. When the prism rests on one oblong face, with the long edges horizontal from left to right, its ends are vertical, and the oblong on which it rests is horizontal, but the other two oblong faces are sloping, or oblique, to you. The ends being vertical, an end view will show the exact shape of the end of the prism, — a triangle which, being equilateral, has its altitude less than its side. Looking now at the front of the prism, a sloping face will be seen. Turn forward the prism now on its lower front edge, so that the sloping oblong face will become vertical, and note the height of the face. Turn it back to its first position, and note that as the face slopes away the upper edge of it is lowered.

When the prism is again in its first position, it will be seen that the front view shows the real length of the oblong and the height of the upper edge of the prism from the ground, which is also shown by the altitude of the triangle of the end view. The oblique edges of the front view of the model in this position are said to be *foreshortened*, and must not, be made as long as the actual edges of the block.

In general, it may be said that an edge placed so that it is oblique to you is foreshortened in a front view; and the more it is inclined to or from you, the more foreshortened it will be. An edge placed so that its end is directly toward you is foreshortened to a point.

In the front view the oblong face seen is foreshortened, so that it equals in height the altitude of the end view. In the top view of the prism in its first position the two inclined oblong faces are both more foreshortened than in the front view; they are so foreshortened that in width from back to front both taken together equal the actual width from back to front of one oblong face. Each end of the top view is therefore represented by a line equal in length to a side of the triangle of the end view.

If these statements are carefully followed, prism in hand, there will be no difficulty in comprehending them.

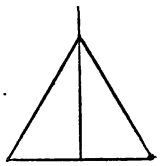
An Equilateral Triangle. — This triangle is always interesting, because whichever side is taken as the base the aspect is always the same, as all the sides are equal. It is a beautiful figure, from the equality of its sides and from the moderation of its angles.

To be developed. — Three views of the horizontal equi. tri. prism; foreshortening; objects like an equi. tri. prism; quality of line.

Suggestions for Study of the Model by Pupils. — Place the equi. tri. prism on the desk, with its long edges horizontal from left to right. What would you draw for the left end view? (*I would draw an equilateral triangle.*) What would you draw for the front view? (*I would draw an oblong.*) How long should the oblong be? (*The oblong should be twice as long as the width of the left end view at the base.*) How high should it be? (*It should be as high as the left end view.*)

Look down on the prism. How many long edges can you see? (*I can see three long edges.*) How wide does the top view look from left to right compared with the front view? how wide from back to front? What would you draw for the top view? (*I would draw an oblong with its long diameter.*) How long should this oblong be? (*It should be as long as the front view.*) How high should it be? (*It should be as high as the base line of the left end view is long.*) Compare the top and front views; how do they differ?

Stand the equilateral triangular tablet facing you. On what part does it rest? (*It rests on an edge, on the base.*) Can you think of a name for the top of the triangle? (*The point, the apex.*) This is also called **vertex**. How far is the vertex from the *ends* of the base? (*The vertex is as far from the ends of the base as the length of the base.*) What is the height of the triangle called? (*The height of the triangle is called its altitude.*)



Can you draw an equilateral triangle on the board? How should the sides of an equilateral triangle compare in length? Draw a horizontal for the base of the triangle, and bisect it. Draw an indefinite vertical to the point of bisection. On this vertical place a point for the vertex, as far from the *ends* of the base as the length of the base, and draw the two sides.

Drawing-Book, *page 8*. — Drawing Three Views of an Equi. Tri. Prism.

Observation Exercises for Pupils. — What can you mention that is like an equi. tri. prism? Could you make anything like an equi. tri. prism? What are you to do in the drawing-book? What do you see on the page? (*I see a picture of a hen-coop like an equilateral triangular prism, with a hen and some chickens.*) And what are they like? (*They are somewhat like ovoids.*) Can you see anything else in the picture? (*I see a dish that looks somewhat like an ellipse.*) What else do you see on the page? (*I see three views of an equilateral triangular prism.*) Can you tell how the prism was placed?

Directions. — The left end, front, and top views of an equilateral triangular prism, long edges horizontal from left to right, are required. A horizontal is printed for the base of the left end view. Draw the left end view according to the directions just given.

From the vertex and the base draw indefinite working-lines to the right. Draw the verticals for the front view, using the given angle, and judging the proper length of the oblong.

Draw the verticals for the top view, using the given angle, and drawing working-lines. Judge the proper height of the oblong, and draw the three horizontals needed. Finish with a broad, gray line, leaving the working-lines light.

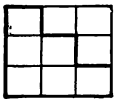
EXERCISE VIII.—Three Views from a Model or Object.

OBJECT. To promote the study of the facts of form in models or objects, and to give pupils practice in drawing them.

Selection of the Model or Object. — It would be very well to select at this stage a simple model or object presenting horizontal or vertical faces at different distances from the observer. A model of a flight of steps or of a cross would serve this purpose. A door bolt presents the same conditions.

Flight of Steps. — A step has two faces, one horizontal and one vertical. The vertical face is called a riser; the horizontal face is called a tread. In the model as viewed from the front, the risers, or vertical faces of the steps, are at different distances from the observer. In the model as viewed from the top, the treads, or horizontal faces of the steps, are at different distances from the observer.

The end view of the model (Fig. 1) should first be shown, as it most clearly expresses what the model is; it also shows all that it is necessary to know about the proportions, except the width of the flight of steps from left to right. Let the pupils give these proportions, and the directions for drawing the end view on the board. It will be noted that the view given is the left end view, and the lowest step is at the right hand. The teacher should be careful to hold the model before the class so that the lowest step will be at the right as the pupils see it. The illustration shows an easy way to draw the end view.



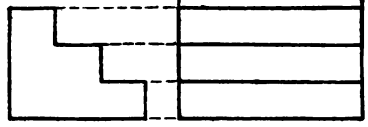


Fig. 1. Fig. 2.

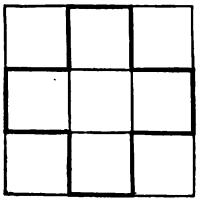
Fig. 3.

The front view of the object (Fig. 2) should next be shown. Obtain from the pupils the statements that the height of the steps and of the risers should be the same as in the end view, and that the only new measurement to get is the width of the flight of steps from left to right. Ask the pupils to compare this carefully with the height, and then to give directions for drawing upon the board the front view. Working-lines should be carried across from the various points in the end view to give the place of lines to represent the edges of the steps. Here only the height of the risers is shown, and the width of the treads from back to front does not appear.

The third view is the top view (Fig. 3). Obtain from pupils the statements that the top view should be placed above the front view, and that it should represent not only the width of the whole block from back to front, but also that of the tread of each step; that the width from left to right is the same as shown in the front view, and that working-lines carrried up from the ends of the lines in the front view will give the

width from left to right for the top view, and that the measurements for the width from back to front of the block and of each tread should be taken from the end view.

Greek Cross. — A pattern and two views of a cross are given here. The height and width from left to right of the arms of the cross are one third the height and width from left to right of the cross. The most rapid way of drawing the Greek cross is by drawing a square on its diameters, trisecting its sides, connecting the points by vertical and horizontal lines, erasing unnecessary lines, and finishing the cross. This gives the front view of the cross.



In the pupils' work the second view is to be the right-side view. The vertical dimensions of the side view are obtained from the front view by extending working-lines toward the right from the right-hand angles of the front view. The two views given show the width of the cross from back to front to be the same as the width of the arms from left to right. The width of the side view is obtained therefore from the width of the arms in the front view. Vertical faces at different distances from the observer are found in this model. The accompanying illustration shows the side view, derived from the front view. The illustration below shows the front and top

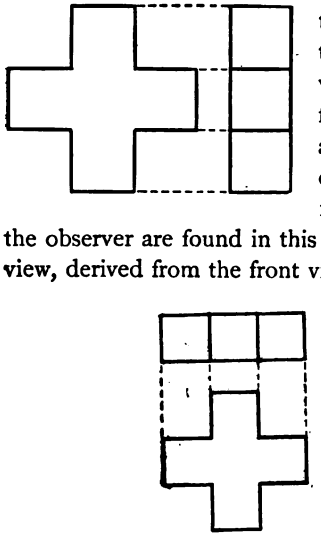


FIG. 1.

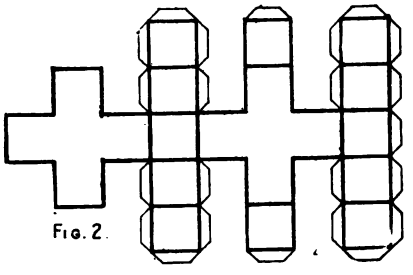
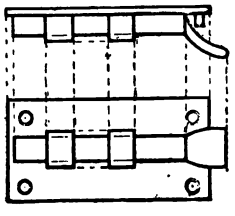


FIG. 2.

views of the cross (Fig. 1) also the pattern of the cross, with laps (Fig. 2). A model of the cross as well as one of the flight of steps can be made by each pupil.



Door-bolt. — Either a flat or a necked door-bolt presents the same conditions of two horizontal or vertical faces at different distances from the eye. The front and top views of a flat bolt are shown in the illustration. The working-lines in all these illustrations are given as dotted lines. Pupils may draw them as light continuous lines. The practice of draughtsmen varies with regard to working-lines.

CHAPTER II.

REPRESENTATION;

Or, Drawing as Applied in Conveying Ideas of the Appearance of Objects.

THE second subject to which drawing is applied, Representation, is now presented. A knowledge of this subject is a requisite for all pictorial drawing. The principles which govern Representation are essentially different from those which govern Construction; although the same models and objects may be used to illustrate both subjects. It cannot be too often said that Construction deals with *facts*, and Representation deals with *appearances*. It is necessary, however, for the proper study of *appearances*, that the facts should be known. Throughout the study of Representation, therefore, take care to have the facts of the form under consideration well understood.

Also note that Construction allows *two* views to show the three dimensions (see page 15) of an object, while Representation requires the appearance of the three dimensions in *one* drawing.

As the appearance of an object is variously modified by its position with regard to the eye, make such position a leading point in the exercises in Representation. Begin the study of the models in all cases by considering the *level of the eye*. In drawing illustrations for the exercises in Representation on the board, sketch first an indefinite horizontal, representing the *level of the eye*. This line may be known as *The Level of the Eye* (*L. of E.*).

EXERCISE. IX. — Cylindric and Rectangular Object below the Eye.

OBJECT. To study the appearance of cylindric and rectangular objects below the eye; to draw the appearance.

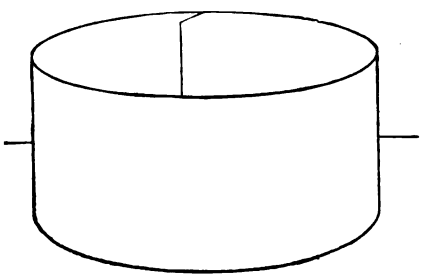
The Models. — A cylindric and a rectangular box are required as models here. In Book 3, the pupils made these boxes from Prang's Pattern Sheets, Nos. 5 and 6, and the teacher was requested to keep them for use in future exercises. If this has been done, the boxes will be all ready to be used for models in this exercise, and they should also be kept for use again after this exercise. If this has not been done, pupils may bring boxes, or they may fold strips of paper to represent boxes open at top and bottom that will serve as models. Open boxes are given as models, as the inside helps the pupils to see the appearance.

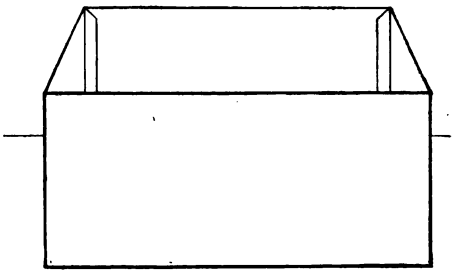
If you have not the boxes, take a sheet of paper ten inches long and three inches wide. Place the paper with long edges from left to right; fold the nearer edge to the farther edge and crease firmly, making two long, narrow oblongs. Cut or tear these oblongs apart with care. Roll one and paste, lapping about half an inch to make a hollow cylinder.

Place the other oblong on the desk with long edges from back to front. Fold the near edge about half an inch over and crease. Turn the paper around so as to bring the other short edge near you. Fold the nearer edge over to the crease just made, and crease again. Unfold. Fold the nearer edge over to meet the last crease made, and crease. Unfold. You now have three creases. Fold the paper over until the middle crease is exactly over the farther one and crease. Unfold. You now have the pattern of the sides of a square box. Paste the lap so as to represent a box. This may twist a little. A little careful pressure on the folded edges taken between the palms of the hands will bring it into shape. You are now provided with two models which will serve, if you have not the boxes that have been made from Prang's Pattern Sheets, Nos. 5 and 6.

The Facts. — The front view of the one model is just like the front view of the other. The top views differ, that of one being a circle, and of the other a square.

The Appearance. — Place the cylindric box at an angle of about 25° below the eye (see page 31), placing it so that the lap will be about in the middle of the farther part. Study the appearance of the upper edge (an ellipse), noting about how much of the lap you see; compare the curve of the upper and lower edges of the box, noting that the lower edge appears to curve more than the upper. Draw the appearance, drawing the top, the bottom, and the sides.





Remove * the cover of the rectangular box and place the box facing you, at an angle of about 25° below the eye. Study the appearance of the upper edges, noting

* If teachers desire, the cover of the box may be simply raised instead of being removed. In that case the box should be placed so that the cover would be at the back. Some pupils might be able to draw the box and the cover.

how much of the inside of the box can be seen. The two farther inside corners are visible in part; therefore the farther edge must appear shorter than the nearer one, and the left and right edges must appear to converge. Draw the front face, the farther edge, the left and right edges, and the inside corners.

Study also the distance of the boxes below the level of the eye. This is an important point, and should always be considered in connection with the appearance.

It will be found that pupils will see the appearance of the upper edges in both these hollow models better than in solid models. The part of the lap visible in the cylindric box and of the inside corners in the rectangular box help very much to show the apparent shape. For the arrangement of the models on the pupils' desks, see page 32. The aim should be to get as much free and unbiased seeing on the part of pupils as possible.

Drill. — The purpose of this drill exercise is to enable the pupils to draw ellipses freely and readily as a preparation for the drawing of the cylindric box. Not more than ten minutes should be given to this exercise.

To be developed. — **Appearance of open cylindric box below the eye; apparent shape of top; appearance of lower curve; appearance of open rectangular box below the eye; apparent convergence of edges; free movement; quality of line.**

Suggestions for Study of the Cylindric Box by Pupils. — Remove the cover of the box. What is the shape of the top view of the box? of the front view? Remember that these terms, "top view," "front view," etc., refer always to the **facts** of an object, — to the object as it is when measured, — and not to its **appearance.** The box is now to be studied as it *appears.* Hold the box just made at *arm's length,* with the top (1) on a level with the eye, (2) two inches below the level of the eye, (3) four inches below. How much of the inside can you see? How much of the lap at the farther part? What is the shape of the top as it appears to you? (*It is the shape of an ellipse.*) Raise the box two inches; does the appearance of the top change? (*The top appears narrower from back to front.*)

Hold the box at arm's length, somewhat below the eye; how much of the lower edge can you see? (*I can see one half of the lower edge.*) What is the appearance of the lower edge? (*It appears to curve downward.*) Is the curve that of a circle or that of an ellipse? If you could see the whole of the appearance, what figure would it be like? Compare the front half of the upper edge and that part of the lower edge which is visible; which appears to curve the more? (*The lower edge appears to curve the more.*) What is the proportion of the height to the width of the box? Measure on your pencil (see page 66). Compare the width of the ellipse at the top from back to front, with the width from left to right. How far below the level of the eye is the box?

Study of the Rectangular Box by Pupils. — Remove the cover of the box. What is the shape of the top view? of the front view? Hold the open box at arm's length,

with the top (1) on a level with the eye, (2) two inches below the level of the eye, (3) four inches below. How much of the inside can you see? (*I can see part way into the box and I can see a part of the inside corners.*) How does the farther edge appear to you? (*It appears a little shorter than the nearer.*) How do the left and right edges appear? (*They appear to run toward each other.*) We say then that they appear to **converge.**

What is the proportion of the height to the width of the box? Measure on your pencil. Compare the width of the top from back to front with the width from left to right. Compare the length of the farther edge with the length of the nearer edge.

How far below the level of the eye is the box?

How do the two boxes compare in apparent width from back to front?

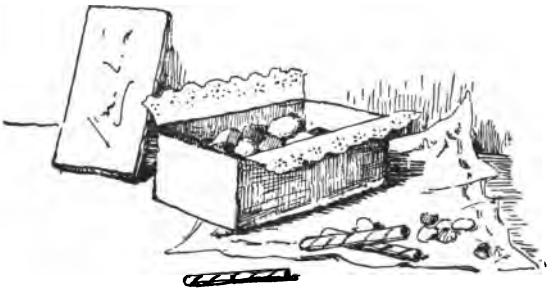
Drawing-Book, *page 10.* — Drill Exercise. Practice for page 11.

Practice. — Use this page for a drill exercise before drawing on page 11. For directions, see page 37.

Drawing-Book, *page 11.* — Drawing the appearance of Cylindric and Rectangular Boxes below the eye.

Directions. — On the upper part of the page or on the desk, lay a pencil or a strip of paper to represent the level of your eye. This should be the same proportionate distance above the drawing that the eye is above the box. Considering this as the level of the eye, draw the cylindric box as it appears to you, in the space at the left, making a good-sized drawing, placing it well in the space. Draw the top, the lower edge, completing the ellipse (then erasing the farther part), the profiles, and the table line.

In the space at the right, draw the rectangular box as it appears to you, making a drawing corresponding in size to the one at the left. Draw the front face, the upper edges, and the inside corners. Draw the table line.



EXERCISE X. — Rectangular Object. — Appearance in front of and below the Level of the Eye.

OBJECT. To study the appearance of a rectangular object in front of and below the level of the eye; to draw the appearance.

Study Page. — If you go into an artist's studio, you will find many studies on the walls, and many more put away in portfolios. There may be a bit of drapery in monochrome; a figure blocked in; a few rocks and trees; some very hasty color effect, done quickly so as to catch the changing color of sea and sky before it vanished. These are many of them made out-of-doors, to bring light and life into the studio work. They have rightly been called studies. An artist could not work without his studies, wherein he seriously strives for some special thought. Thought is always necessary to any good work. However easy the result may seem, study always lies back of it.

The artist's study is frequently begun by *sketches*. These are the rapid expression by drawing or color of what he sees or thinks. Later come the more serious *studies*, which find their result finally in the finished picture. Having the thought of the necessity for *studies* in art, an opportunity is occasionally given throughout the course for a study page. All the pages in a drawing-book are in a way study pages; but in some, opportunity should be given for expressing the first impressions, which will be more fully developed in the course of the next exercise. It is a great mistake to suppose that a drawing-book should be of even excellence throughout. If the last page is not better than the first, there would seem to be no progress. If the first page is as good as the last, there must be some great constraint about the teaching. The book should be a record of progress, and should show the steps which have been taken. It is a pleasure always to see the growth of work, — for example, a study page showing the results of the first study, and a page following showing the effect of that study in better work. This exercise gives an opportunity for a study page.

Rectangular Object. — Cylindric objects were given for definite study in Book III., as they present fewer complications than any others. In cylindric objects the special points to be noticed are, —

1. That a circle seen obliquely appears like an ellipse;
2. The more obliquely the circle is seen, the more it approaches a straight line;
3. The less obliquely the circle is seen, the more it approaches a circle.

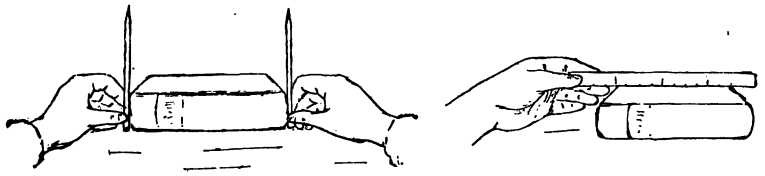
When pupils have learned to see and to express by drawing (having gained by practice the ability to draw good ellipses readily) the change that a circle undergoes in appearance according to its position with relation to the eye, much has been accomplished. In previous books some work has been done in seeing and drawing the

appearance of rectangular objects; more definite study of these objects is now taken. It is the plan of this course to approach each subject in the simplest and most natural way, leading the pupils first to express what they see, without laying down any rules, and later leading them to develop the simple principles from their own experience, formulating them in their own way.

A study page for a rectangular object is given here, preparatory to the next exercise, in which the pupils will be led to a simple formulation of what they have studied. The teacher will find the methods of study of the apparent shape of the book and the apparent direction of its edges, given below for the pupils, of the greatest assistance in working out this exercise previous to giving it to the class. As this is a first study of the appearance of a book, it will be well to take as new a book as possible, because of its well-defined edges. Study should also be directed to some characteristics of a book. Every pupil will know that the book differs from a block, but will perhaps be a little puzzled to tell just how without some careful leading. The materials of which a book is made, — the kind of cover, whether paper or board, flexible or stiff; the kind of binding, whether paper, cloth, or leather, — all contribute to its general appearance.

To be developed. — Appearance of rectangular object; foreshortening of the top; nearer edges longer than farther edges; convergence of left and right edges; appearance of curved edges and bands; study page.

Suggestions for Study of the Object by Pupils. — Select the thickest and newest book you have. Lay it well back on the desk, the back of the book toward you. Place a pencil vertically at each end of the lower visible horizontal edge. Close one eye, and incline the pencils toward each other until they appear to cover the left and right edges of the book. What is the apparent direction of the left and right edges? (*They appear to converge.*) Which *appears* longer, the nearer or the farther edge? (*The nearer edge appears longer than the farther edge.*)

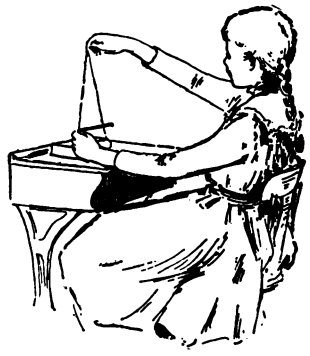


Slip a piece of string three or four feet long under the upper cover of the book, as far as the binding. Sit opposite the middle of the book, and holding the strings with one hand, move them until they hide the left and right edges of the book-cover. In doing this, incline the strings toward each other as the case may require, but do *not* incline them backward or forward. See Fig. 1. Do they meet above, below, or on the level of

your eye? (*If you hold the strings so that the left and right edges of the book are covered, the strings will meet exactly on a level with your eye.*[1])

Place a ruler against the strings so that the lower edge of the ruler just hides the farther edge of the cover. Look now at the shape of the cover as inclosed between the strings and the ruler; describe it. (*It appears to be a four-sided figure having the back and front parallel, but the left and right sides* **converging**.) Compare the two parallel sides as to length. Compare the distance between them with the length of the nearer side. The top face is said to be *foreshortened*, because it appears less from back to front than it actually measures.

Hold the strings with the left hand, and compare by measurement on the pencil the length of the book and the distance between the book and the point where the strings meet.



Put away the string and ruler; measure on your pencil, held vertically, the distance between the nearer and the farther edge, and compare it with the length of the nearer edge. Look now at the ends of the book and at the bands of the title-piece. Do they appear to curve? if so, which way do they seem to curve? (*The ends seem to curve a little. The left end seems to curve to the left, and the right end seems to curve to the right. The band of the title-piece nearest the end does not curve quite as much as the end, and the other band hardly curves at all.*

Drawing-Book, *page 12*. — Study Page for Exercise XI.

Drawing. — Make a large drawing of the book as you see it. First draw the part toward you; then draw a horizontal for the level of the eye, *placing it as far above the drawing in proportion to its size as the eye is above the object itself;* on this line place a point directly above the middle of the drawing; draw the top of the book, making the left and right sides converge toward the point just made.

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[1] This exercise serves to bring out, not only that the left and right edges appear to converge, but also that they appear to converge toward a point on a level with the eye, — two extremely important points. The exercise was presented by Mr. Perry at his Saratoga summer classes in 1885, 1886, and 1887, to the great satisfaction of the teachers who were members of the class, and who have since used it in their own teaching.

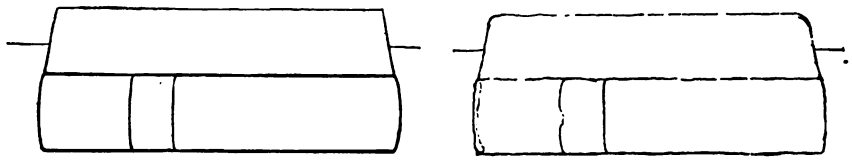
EXERCISE XI. — Rectangular Object in front of and below the Level of the Eye. — Its Appearance.

OBJECT. To study the appearance of a rectangular object in front of and below the level of the eye; to draw the appearance.

The Object. — The book is given as an object for these two exercises because it is within the reach of every pupil. It is, moreover, a very familiar object; and it is well to keep to the plan of studying those things with which we are acquainted and about which we already know a little, rather than to take things which are wholly new. "From the known to the unknown" cannot be too often repeated; the eagerness to get to the unknown should, however, not be so great as to leave out of sight the known; for the mind builds on what it has already received. The thousand and one associations that we have with objects which are constant companions form the best basis for direct study.

The appearance of the whole gained by the study of the apparent shape of the horizontal face and the direction of edges was the point especially taken up in the last exercise. Study should now be directed to other characteristics, — characteristics that should guide in the selection of the book to be used as a model.

No artist would think of making a picture of books just fresh from the bindery. It is true, they then show the skill and care with which they have been made to greater perfection than they can ever do after they have been used; but, nevertheless, they would not be beautiful in a picture. Why is a worn book more beautiful? The hardness of the edges is worn off, the outline is broken a little, the possible crudeness of color is softened; all this adds to the agreeable effect. But still further, a new book is devoid of associations; a book that is worn brings to us a sentiment (many times not consciously realized) that others have read it and enjoyed its thought. It awakens in us a recognition of the humanity that surrounds us; it seems to us in some way a friend.



For this exercise, have pupils select from their books those that are worn. In drawing the books, expression may be given by making the farther edges a little less distinct than the nearer ones, by an outline somewhat broken, by noting which

part casts a shadow, and strengthening the edges or profiles of the parts which cast the shadows. A box can be given as a model if the teacher prefers; but a box is not invested with as much human interest as a book.

To be developed. — Selection of Object; appearance of object; shadow; rendering.

Suggestions for Study of a Book by Pupils. — Who has a well-worn book? I do not want one that has been carelessly treated. Yours is a good example of what I want. Will you bring it to me? I have here also another book; will you tell me something about this book? (*It looks very new.*) Yes, it is new. Will you tell me why one book looks new and the other looks old? (*The new one is clean and bright, the edges are even, the corners are square, the back is not broken any at the top or bottom, the leaves make sharp edges at the corners, the title-piece is bright.*) That is very good. Why does the other look old? (*It has round corners, the edges of the cover are broken a little, the top and bottom of the back are bent in a little, the leaves look soft at the corners, the title-piece is rubbed and all the letters are not plain.*) How do you suppose this book came so worn? (*Because somebody studied or read in it a good deal.*) Why is not this new book worn? (*Because it has not been handled much.*) Find the most worn book that you have. Study it with pencils and string as you studied the book in the last exercise. What do you find out about the front and back edges? (*The back edge appears shorter than the front edge.*) Which is farther away? What can you say about the farther edge compared with the nearer edge? (*The farther edge seems shorter than the nearer edge.*) How do the left and right edges of the cover look? Where do you think they will meet if continued? Which side of the book casts a shadow? How can you draw the book so that it will look worn, — so that it will look as if somebody had studied it?

Drawing-Book, *page 13.* — **Drawing the Book.**

Observation Exercise for Pupils. — What do you see on the page? How does the box in Fig. 1 stand? (*It stands facing, with its long edges running from left to right; and it is below the level of the eye.*) What can you say of the farther edge of the top? of the left and right edges? Where do you think the level of the eye is? What can you tell about the slate? What can you tell about the box in Fig. 3? How large will you make your drawing of a book?

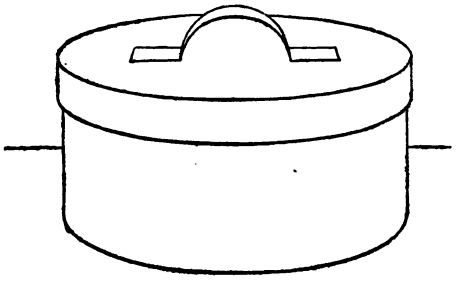
Directions. — Think of the space in which you are to draw. Decide on the proper width of your drawing from left to right. Indicate on the page or on the desk the level of the eye. Draw the part of the book nearest, then the top. Finish the lines farther from you a little less distinctly than the nearer ones. If the edges of the book are a little broken and a corner is rounded, show these things by a broken outline. If one side of your book casts a shadow, make the lines on that side darker.

EXERCISE XII.—Covered Box with Handle.

MODEL: *A Box.*

OBJECT. To study the appearance of a cylindric box with a handle; to draw the appearance.

The Model. — The boxes made by pupils in Book III. will again serve as models. Flat handles made of strips of cardboard a quarter of an inch wide may be cut and pasted on the cover of these boxes.



The box illustrated in the drawing-book apparently has a leather handle, which is rolled in the middle and spreads at the ends. It will be noted that the handle at its widest part is slightly nearer the back of the cover than it is to the front. Any object far away will appear smaller than the same object near by. If two distances equal to each other are at unequal distances from the eye, that which is farther away will appear less than that which is nearer. This must be the point for special attention in this exercise.

It may be studied in a very simple way by observing a pasteboard circle with the centre strongly marked. Hold the circle horizontal and somewhat below the eye, so that it will appear like an ellipse. Draw the ellipse with its diameters.

The Centre of the Ellipse not the Centre of the Circle. — The centre of this ellipse does not represent the centre of the circle. The apparent width of the circle from back to front is indicated by the short axis of the ellipse, which is bisected by the long axis; thus the centre of the ellipse is marked, and the two parts of the short axis are equal. Now let the position of the centre of the circle be noted, and its distance from the front be measured on a pencil held vertically; then let the distance of the centre from the back be measured in the same way, and the two measurements compared. If the measurements are taken correctly, it will be found that the apparent distance from the front to the centre is greater than the distance

from the centre to the back. If the nearer distance appears greater than the farther distance, then more surface appears in front of the centre of the circle than beyond it, and the centre of the circle will be beyond the centre of the ellipse.

But while this new observation is being followed up, there are other points which must not be forgotten. The curve of the lower edge of the cover of the box will appear a little deeper than that of the upper edge, and the curve of the lower edge of the box will appear deeper than all. *A circle seen obliquely appears like an ellipse; the more obliquely it is seen, the more it approaches a straight line; the less obliquely it is seen, the more it approaches a circle.* It must also be remembered that the ends of ellipses and half-ellipses should be neither very round nor pointed.

To be developed. — A circle seen obliquely appears like an ellipse; the centre of the ellipse not the centre of the circle; the less obliquely the circle is seen, the more it approaches a circle in appearance; tangential union; quality of line.

Suggestions for Study by Pupils. — Here are the boxes made from the pattern sheets, with the covers on. In Exercise XI. they were studied with the covers off. We now wish to study them with the covers on, and still more with handles on the covers. Cut a strip of paper one quarter of an inch wide and an inch long, and paste it on the cover as a handle, using the diameter of the top as a guide in placing it evenly. The handle may need a little bending and shaping before pasting and placing it. Press the ends down, and hold them a few moments between the thumb and fingers.

Put the cover on the box. Place the box so that the cover is not far below the level of the eye. Look at the *apparent* distance from the handle to the back of the cover. Compare it with the *apparent* distance from the handle to the front of the cover. Which appears greater? Look out the window. What do you see? (*I see a house.*) Do you see the whole house? (*I see two sides of it. I see the roof and from the roof to the ground*) What are you looking through? (*I am looking through a window.*) Through how many panes of glass do you look to see the house? (*I can see all of it through one pane of glass.*) How large does the house appear to you, then? (*It does not appear to take up quite so much room as the pane of glass.*) When you look down the street, which look larger, the people that are near to you or those some distance away? Could you tell me now in some general way about the appearance of things that are near and those that are far away? (*Things that are near to us appear larger than things that are far away. The farther away anything is, the smaller it looks.*) Now look again at the apparent distance between the handle and the back of the cover, and compare it with the distance between it and the front of the cover.

What does the top of the cover appear like? (*It appears like an ellipse.*) How does the lower edge of the cover appear? (*It appears like half an ellipse.*) If you could see all the edge, how would it appear? How does the part that you see compare with the appearance of the nearer half of the top of the cover? (*It appears to curve downward a little more.*) How does the lower edge of the box appear? (*It appears like half an ellipse.*)

If you could see the whole of the edge, how would it appear? How does the part that you see compare with the appearance of the lower edge of the cover? (*It appears to curve downward a little more.*) How do these three curves appear to meet the profiles? (*They appear to meet the profiles as if they would not cut across the profiles, but as if they would, after touching the profiles, curve around to complete the ellipses.*) If you should draw the ellipse for the top, where in the ellipse would you place the handle? (*I would place the handle a little nearer the back part than the front part.*)

Drawing-Book, *page 14.* — Drawing the Box.

What do you see on this page? What kind of a handle do you think the box had? How does the box seem to be placed? (*The box seems to be placed on a table below the level of the eye.*) Why do you think it is below the level of the eye? Where is the handle placed in the ellipse of the top? (*It is placed a little nearer to the farther part of the ellipse than it is to the nearer.*)

What do you think is kept in this box? What could you keep in your box? What are you to do upon this page? About how many inches wide will you make your drawing? Why will you not make it about two inches wide?

Directions. — Draw the appearance of your box enlarged to fill the space at the right. Study the space before beginning to draw. Draw the top, the lower edge of the cover, and the lower edge of the box. and the profiles. Draw the handle last.

CHAPTER III.

DECORATION;

Or, Drawing as Applied in Ornament.

THE general character of the work in Decoration is considered on page 48. The direct purpose of decorative art is the production of beauty. In the exercises in Decoration, therefore, the pupils should be led to the study and appreciation of beautiful forms, figures, lines, and arrangement in geometry, Nature, and historic ornament.

It will be noticed that the original work required is very simple. The work in decorative design has been frequently made so complex and abstract as to be entirely beyond the interest of the pupils.

EXERCISE XIII. — Ornament.

From a Copy.

OBJECT. To study a historic ornament; to draw its outline.

Saracenic Ornament. — The ornament given in Exercise XIII. Book 3 and the ornament in this exercise are simple forms of Moorish, or under its more inclusive designation, Saracenic ornament. The term Saracenic covers not only Moorish but also Arabian ornament, from which the Moorish sprang. Saracenic ornament was an outgrowth of the Mohammedan religion. It arose in Arabia and was developed on the eastern and southern shores of the Mediterranean by the Arabians and the Moors. They conquered Spain and inhabited it. During their domination in Spain, the Saracenic style reached its greatest magnificence.

The Moors were a very remarkable people, highly civilized and keenly intellectual, and their ornament bears the stamp of these characteristics. Forbidden by their religion to imitate plant or animal forms, they based their ornament on geometry. They delighted in a universality of ornament, and reveled in its prevalence about them, and decorated the entire surfaces of the walls of their rooms and halls. The construction of the surface covering was to them an intellectual pastime; its geometric development is full of intricacy and subtilty, and rewards the most careful study. In some cases the geometric basis is seen in straight-lined figures and in interlacing of straight lines and circular curves; in others, it is clothed with most beautiful curves resulting in figures which, while conforming strictly to their religious restrictions, yet show the study of the principles of natural growth. The greatest examples of their decorative work are found in the Alhambra, where the surface coverings, beautiful in color and in design,

produce a wonderful richness. In these decorations the same regard is shown for the effect produced by the combination of brilliant colors in small quantities, and for elaborate but not confused detail, that is seen in Oriental fabrics.

The fondness for surface covering is manifest in all Saracenic art, from the early Arabian down through the Moorish. The general idea of tapestry and damask and of modern wall-paper as surface-covering had its origin here. The word "damask" is derived from the name Damascus.

The Alhambra was built by the Moors in the fourteenth century, in the height of their power. It is most elaborately decorated throughout, and wonderfully and beautifully exemplifies the Saracenic style. Throughout the decorations of the Alhambra, the element shown in Fig. 1, and which was given in Exercise XIII. Book 3, can be traced. It is variously modified by lengthening, by broadening, by division into halves as in the example of this exercise, by subdivision of the sides in various ways, and by the use of the half alone; but through all these changes it retains its characteristic shape.

The ornament given in this exercise, Fig. 2, was taken from a wall in one of the great halls of the Alhambra. It is one of the modifications of the type, Fig. 1. Both examples are reproduced here for comparison. Fig. 1 should be drawn on the board

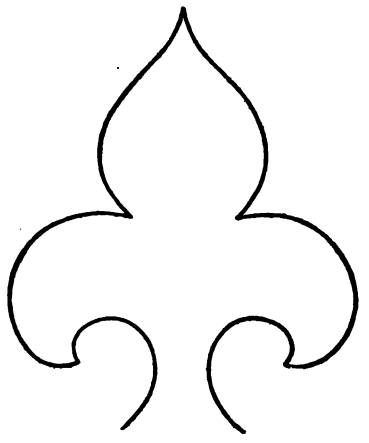


Fig. 1.

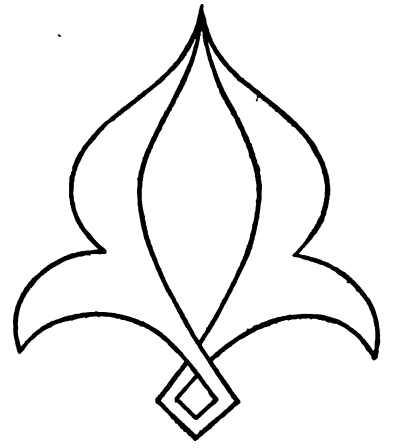


Fig. 2.

so that pupils may be led to trace its characteristics in the example given in the Drawing-Book. If the example from Book 3 has been given to pupils as a memory exercise, as the Manual suggests, a pupil may be called on to make this drawing. Comparing the two examples, it will be seen that the general shape and its peculiarities remain, although the proportion between the upper and lower part differs in the

two figures and the proportion of the parts themselves differs. In Fig. 2, at the base, a suggestion is given of **interlacing**, which is a characteristic feature in Saracenic ornament. It is true that in Celtic ornament there is also much interlacing; but it has more the nature of braiding, as its elements are mostly curved, instead of straight, as in Saracenic ornament.

Great attention should be paid to the study of curvature and proportion in historic ornament. It is largely through historic ornament that taste in decoration is formed and cultivated. It is of the greatest importance, therefore, that each pupil should have copies of good examples of historic ornament. They are in the study of decoration, like fine examples from standard authors in the study of literature, necessary to the formation of taste.

To be developed. — Characteristic outline; beauty of curvature; symmetry; quality of line.

Drawing-Book, *page 15.* — **Drawing the Ornament.**

Suggestions for Observation Exercise for Pupils. — Who can draw the Moorish ornament that we had in Book 3? Will you draw it upon the board? Several of you may come. How does the figure in the exercise for to-day resemble it? How does it differ? Cover the two inner curves of the copy that start from the top if you can, and then compare the *outline* of the two figures. Who can come to the board and draw the *outline* of this figure? Several may come, and each may draw the outline of this figure beside one of the figures just drawn, omitting the half square at the bottom.

What are you to do in the Drawing-Book? From what place is this ornament? The Alhambra is built on a high rock overlooking the city of Granada. What can you tell of Spain? Can you find it on the globe?

How many curves are there in the outline of the figure? Move over the curves of the copy with both hands, beginning at the top — one, two, three. Move over the inner curves with both hands, beginning at the top. Can you trace the figure in the air with both hands?

Directions. — On the copy draw a light vertical as an axis of symmetry; also horizontals to connect the ends of opposite curves.

Draw the figure in the space at the right. First draw the axis of symmetry and two horizontals to correspond to those drawn on the copy. Practice movement over each curve of the copy, then the same movement over the space at the right; then draw with one sweep. Erase construction lines and errors, and complete the figure in broad, soft lines.

EXERCISE XIV. — Rosettes. — Decorative Design.

MODEL: *Five-Petalled Flower.*

OBJECT. To study arrangement in the top view of a flower; to design a rosette from the top view.

Conventionalization. — The laws of growth, which are recognized and recognizable in all good ornament, are derived from the laws of growth in Nature. It would be a mistake, however, to conclude from what has been said that a pictorial imitation of Nature is good in ornament. A pictorial imitation of Nature represents the accidents of growth. Order, regularity, and symmetry are the normal laws of growth, while the irregular is accidental. This idea is developed in the treatment of conventionalization.

"Flowers or other natural objects should not be used as ornaments, but conventional representations founded upon them, sufficiently suggestive to convey the intended image to the mind without destroying the unity of the object they are employed to decorate. *Universally obeyed in the best periods of art; equally violated when art declines.*"

In this exercise we approach the subject of conventionalization, which is frequently misunderstood. Some, having a totally wrong impression of conventionalization, think of it only as a means of taking all the life and grace out of a leaf or a flower, and reducing it as nearly as possible to the hard lines of a geometric figure. This is a wholly wrong conception. True conventionalization searches for the life and the marvellous manifestations of growth in the leaf or flower. Natural leaves are more or less unsymmetrical; a leaf-type would be symmetrical; conventionalization rejects the occasional irregularity, and accepts the beauty of the symmetry of the type-form. Conventionalization has sought in the natural leaf for the beauty of symmetry, the beauty of general form, the beauty of radiation, — or, as it might be phrased, the beauty of stability, — the beauty of proportion, the beauty of general curvature, and renders them in the conventionalized leaf. Every line of the conventionalized leaf can be traced as typical of the natural leaf.

Pupils should be led to seek for type-forms of natural leaves by comparing many leaves of one kind, and to discover and express the peculiar beauty of each type-form. This will be true conventionalization.

The purpose of this exercise is entirely distinct from that of botanic study. In botanic study, the various parts and organs are studied with minuteness, and all the wonderful structure is revealed. In studying a flower for decorative purposes, the details are not taken up, unless for some special end; but the general plan as to form is studied, and is rendered with faithfulness to the type-form, and not to the individual.

Children will comprehend the thought readily, if it is presented to them in an attractive way.

Color. — This exercise may be made more interesting by the use of color. A rosette of colored paper in yellow, using two tones, the lighter for the petals and the darker for the centre, may be pasted on Fig. 1.

To be developed. — **Observation of flower; type; beauty; true conventionalization; rosette; quality of line.**

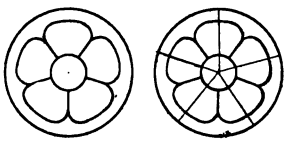
Suggestions for Study of Buttercups by the Pupils. — (Each should have two or more, if possible.) What is the color of your flower? Look at the inside and at the outside of the flower. What do you notice? (*There is a circle of yellow leaves, and outside of them there is a circle of green leaves.*) The inner circle of flower leaves is called a **corolla**, or a little crown; the outer circle is called a **calyx**, or cup.

How many leaves has the corolla of the buttercup? (*The corolla has five leaves.*) The leaves of a corolla are called **petals**. What is the general shape of the centre? The centre is filled with threadlike parts, stamens and pistils, too small to be studied now. How many petals has the buttercup? Are they all alike? (*They are very nearly alike; some are wider than others, and they are not all shaped just alike.*) Look at your other buttercup and see whether the petals are all alike. Think of a perfect buttercup; can you describe it? (*I think the petals would be even, and would be shaped like the prettiest petals here.*)

Drawing-Book, *page 16.* — **Cutting and Drawing Rosettes.**

Study of Fig. 1. — What is Fig. 1? (*A circle.*) How is it divided? (*It is divided into five equal parts by lines starting from the centre.*) (The teacher gives the terms **radius**, plural **radii**, and **circumference**.)

Directions. — Fig. 1. Cut as perfect a rosette as possible from yellow paper, and paste on Fig. 1. Make the rosette smaller than the circle, so that there will be a space between the rosette and the enclosing figure.



Drawing-Book, page 16.

Fig. 2. Divide the circumference into five equal parts, and draw five radii. Draw in this circle a rosette from the buttercup, making it as perfect as possible. First draw the petals lightly, using each radius as an axis for a petal. Add a central circle of proper proportion to the rosette. Make the rosette smaller than the enclosing figure. The radii may be erased in finishing the figure.

EXERCISE XV. — Decorative Design. — Rosette.

From a Flower Form.

MODEL: *Five-Petaled Flower.*

OBJECT. To study the top view of a flower; to draw a rosette from the top view.

Geometry. — Geometry underlies all decorative design. In designs complete in themselves, like rosettes, it appears in the general plan, as illustrated by the enclosing figure and its radii in the preceding exercise. "Order is Heaven's first law."

Geometry and conventionalization have been employed in the ornament of all nations, and have never been wholly ignored. To quote from various eminent writers: —

"Nature is full of geometry, and when natural forms are employed there must be Nature's geometry."

"In trying, therefore, to produce symmetric designs from natural forms, so far from being artificial or formal, we are in strict accord with one of Nature's grandest principles. Nature is not, however, to be exactly imitated. Conventionalization is a strict adherence to the plan of development, and the adaptation of plant forms to ornamental uses. A naturalistic view is a mere surface view of Nature, concerning itself only with what is open to everybody, and neglecting those hidden truths which lie at the root of the whole subject."

"Flowers must be something more than flowers to the designer; he must seek out the plan of development, and then adhere closely to natural laws."

"Natural forms are rendered into ornament by subordinating the details to a general idea, and we should endeavor to seize upon the simplest expression of a thing rather than to imitate the thing itself; that is, conventional representations should be made, founded upon natural objects, sufficiently suggestive to convey the intended image to the mind without destroying the unity of the object they are employed to decorate."

Although the eye may fail at first to perceive the geometry of natural forms, a little study will bring it to light, and will also trace in the arrangement of leaves and flowers all the modes of repetition, symmetric and radial, which have been practiced in geometric design. The wisdom, then, of beginning instruction in design with the use of geometric figures and geometric plans of construction becomes apparent, for by it preparation is made for an intelligent use of the wealth of material which Nature affords.

The purpose of this exercise, like that of the last, is to lead to the study of the beautiful plan of natural forms. A different flower should, however, be chosen for study. Five-petaled flowers are suggested because they are so much more common than flowers of four or six petals. A large flower is not needed for this purpose; a beautiful plan and beautiful shapes reveal themselves in the tiniest flower.

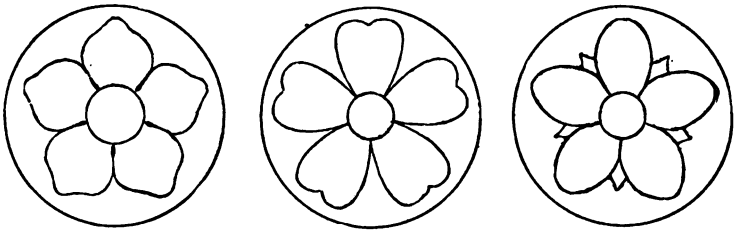
In the study of the five-petaled flower, the regular five-sided figure, the **pentagon,** will be brought out. The change in the appearance of the flower, according to its change in position, can also be developed. If a flower is held directly below the eye, a top view is obtained; but if it is held only a little below the level of the eye, it will appear like an ellipse in general shape.

To be developed. — Study of the flower for arrangement, proportion, grace; plan; beauty as a whole; quality of line.

Suggestions for Studying the Model. — (Each pupil should have a five-petaled flower, not a buttercup, if possible.) What is the shape of the petals of your flower, as seen in the top view? What is the name of your flower?

Study carefully the beauty of the flower, in the whole **arrangement** and **proportion,** in the **shape** of the petals, in the **grace of the curves.** These are the elements which will make the beauty of the decorative figure.

Can you think of an object which you can make and decorate with a rosette, used either simply or repeated for a border or for a surface covering?



(The teacher should encourage the pupils to use the rosettes drawn, in decorating some object by drawing, by cutting, by embroidery, by carving, or by painting.)

Drawing-Book, *page 17.* — Drawing a Rosette.

Observation Exercise for Pupils. — What is Fig. 1? Hold your flower so that it looks like the higher flower in Fig. 1; like the flower on the right. What is Fig. 3? How do the rosettes in Fig. 3 differ from the flowers in Fig. 1?

Directions. — A circle is printed. Within the circle draw a rosette from your flower, making the rosette a little smaller than the circle, following the order given for the practice page. To limit the size of the rosette, make a point on each radius about one-eighth of an inch from the circumference. Finish the rosette in even, gray lines.

CHAPTER IV.

REVIEW.

THE remaining exercises in the book are planned to review the work of the book in the three subjects. In Exercise XVI., the work in Construction is reviewed; in Exercises XVII. and XVIII., that of Representation; while Exercises XIX. and XX. include under Decoration the study of natural form and of decorative arrangement.

EXERCISE XVI. — Toy House. — Three Views.

MODEL: *Toy House made by the Pupil.*

OBJECT. To make a model of a house; to study its end, front, and top views, and to draw them.

Toy House. — This exercise returns to the subject of construction, to recall the work in the first part of the book. It will be specially attractive, as it is a miniature presentment of a home, where there is shelter and companionship. Around it the fancy of the children will play with delight.

A similar form can be made by placing a right-angled triangular prism on a square prism, although it will lack the projecting roof at either end. A triangle furnishes a suggestion for shelter; tents and roofs are common examples. The angle chosen for the roof in this example is a right angle.

It will be necessary to begin the exercise by having the model made. Be careful in drawing the views to note the overhanging roof at both sides and ends.

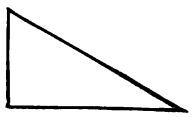


Fig 1.

Fig. 2.

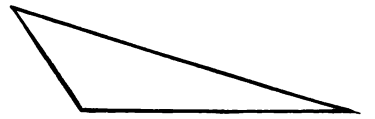


Fig. 3.

Illustrations are given (for the teacher's use) of triangles named from their angles. Fig. 1, a right-angled triangle, having one right angle; Fig. 2, an acute-angled triangle, having all its angles acute; Fig. 3, an obtuse-angled triangle, having one obtuse angle.

To be developed. — The pattern of a house; making the house; end, front, and top views; imagination; appearance; quality of line.

Prang's Pattern Sheet No. 9. — Making the Model.

Suggestions for Study of the Pattern. — What is Fig. 1? Fig. 2? How many parts has Fig. 1? Which parts are alike? Can you tell what parts of the house they are? What is the shape of the front of the house? the proportion of height to width? What is the shape of the end? (*The shape is that of a square with a* **right-angled triangle** *on the upper side.*) What is the proportion of height to width?

Cut out Fig. 1, fold firmly along the light lines, and paste it. Cut out Fig. 2, and paste it on as a roof.

Suggestions for Study of the Model by Pupils. — Hold the model at arm's length, on a level with the eye, end toward you. How does the *end view* differ from the *end* of the house as printed in the pattern? (*The roof is seen overhanging in the end view.*) Can you draw the end view on the board?

Hold the model with the front toward you. How wide is the front of the house? (*The width of the front is equal to the whole height of the house.*) How high is the front view? (*As high as the end view.*) What part of the house does the roof hide in the front view? Can you draw the front view on the board, carrying the various heights across from the end view by working lines?

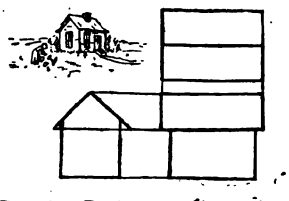
Look down on the model. How wide is the top view from left to right? (*The top view is as wide from left to right as the roof in the front view.*) How wide is the top view from back to front? (*The top view is as wide from back to front as the roof in the end view is from left to right.*) Can you draw the top view on the board?

Drawing-Book, *page 18.* — Drawing Three Views of a Toy House.

Observation Exercise for Pupils. — What do you see on this page? Who can tell me a pleasant story about it? Of what shape are the doors and windows, do you think? Place your houses facing you. Place them turned. How is the house in the picture placed with regard to you? Can you hold your house so that it will look like the one in the picture? Will you hold it below or above the level of the eye?

Hold it now so as to get a top view; a front view; an end view.

Directions. — A printed line is given for the base of the end view, and an angle for the lower left corner of the front view. On the printed line as a base, draw a square lightly. Draw a light vertical diameter, extending it indefinitely upward. On this line fix the height of the end view, and draw the roof, remembering to make it overhang.



Drawing-Book, page 18, completed.

Draw the front view, carrying indefinite horizontals from the end view. Make the width of the front of the house equal to the height of the house, and add to the width at each end for the roof.

Draw the top view, making it as long as the roof in the front view and as wide as the roof in the end view.

Making. — Make at home such a house, but change the dimensions, making the house three inches wide from left to right, and four inches wide from back to front.

Draw first the three views of the house, — the end view, the front view, and the top view; then draw the pattern. The house can be made of pasteboard or of wood. Windows, a door, and a chimney might be added, so that the house when made would be a model of the little house illustrated on the page of the drawing-book.

The pattern of the chimney furnishes quite a problem. Most pupils, however, will work it out for themselves.

EXERCISE XVII. — Blocking-in a Group of Objects.

OBJECT. To arrange a group and to show its mass by simply blocking-in.

Grouping. — An exercise on the arrangement of a group was given in Book III.; but as there will doubtless be some pupils who have not had such an exercise, and as a review will be profitable to all, it will be well to develop ideas of arrangement again, something after the manner given for that exercise. Almost all pupils will have seen

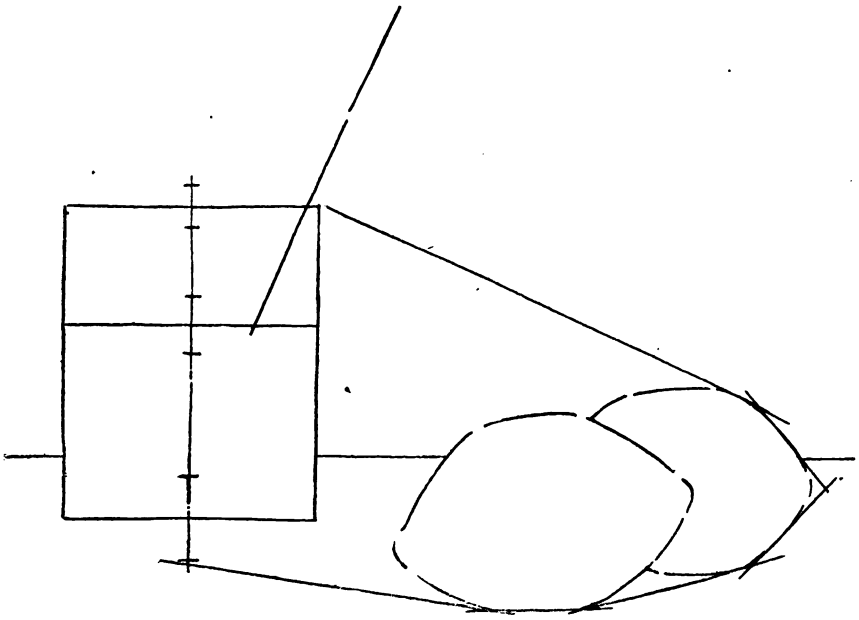


Fig. 1.

a photograph of a family group, and thus the name may be familiar to them although the idea may not be very clear in their minds. This thought can be used in developing the lesson. Opportunity could be taken also to show that a photographic group, or any picture of a group, is not pleasing when the faces are all looking straight forward, because there is then no evidence of the interest of the people in each other, which is one of the elements of a group which make it attractive.

It must not be forgotten that the objects in a group should be such as naturally belong together. If the natural objects are fruits, the other object should be one that properly accompanies fruits. If the objects are vegetables, the object chosen should be one that properly accompanies vegetables. In the illustrations on the Drawing-Book page, this thought has been carried out. Fig. 1 at once suggests lemonade;

Fig. 2 suggests refreshment in general by water and fruit. In the illustration on page 133, you see the measure with the vegetables.

Blocking-in. — There is no means of getting so quickly the general shape of a group as by blocking-in. But very few lines should be used in blocking-in, for if every change in direction should be represented by a line, the process of blocking-in would become that of studying details. Studying the whole or the mass should be the first

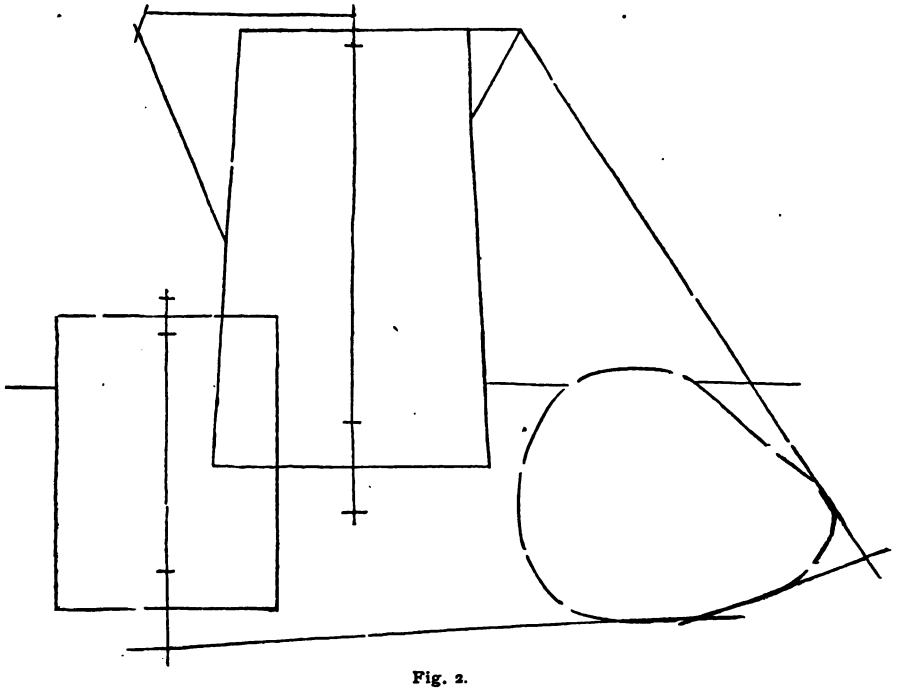


Fig. 2.

step always. The illustrations Figs. 1 and 2 will show how a few lines will bring out the general mass; a few more have been added to bring out each object as a whole.

You will note that the blocking-in lines sometimes touch the outlines of the objects, sometimes cross them, and sometimes do not touch them at all. There is no rule for blocking-in which excludes any of these conditions; any of these ways may be taken which will help to express the general shape of the group.

Blocking-in has more than the immediate effect of getting the shape of the particular group to be drawn. It induces a habit of mind; it leads to study of the mass everywhere, to large views, to looking at the whole before the parts, beginning first in judgment of a single form, then of a group of forms, then of actions, then of events.

Drill. — A drill exercise in drawing ellipses is here given, as a preparation for drawing a cylindric object in the group.

To be developed. — Selection; grouping; place of principal and secondary objects; figure made by group; variety; repose; unity; blocking-in.

Suggestions for Study by Pupils of the Arrangement of a Group. — In studying the arrangement of a group, consider, —

1. The place of the principal object.
2. The place of the secondary objects.
3. The figure made by the group on the table.
4. Partial view of some of the objects.
5. Upper line of the group.
6. **Variety** in the positions of the axes and in the faces visible.
7. **Repose** of the objects.
8. **Unity** of the group; distance between objects.

(The teacher will recall these topics to the pupils by arranging a group where all can see, and calling not only for opinions as to the arrangement, — whether it is pleasing or not, — but also for changes that should be made and the reasons for them. The topics are stated more in detail on page 44. The teacher can also vary this exercise to advantage by asking pupils to bring in pictures of groups of objects, of animals, or of people, see page 47, to be studied with reference to these points by the class.)

Arrangement of a Group by Pupils. — Arrange a group of two, or at the most three, very simple forms, comprising a cylindric object and fruit or vegetables. As you arrange the group, study it with reference to each of the points mentioned. The aim should be to make the group as pleasing as possible in general effect.

Drawing-Book, *page 20.* — Blocking-in a Group.

Observation Exercise for Pupils. — Describe the group, Fig. 1. How could you block in the group? Describe the group, Fig. 2. How could you block it in?

Study your group; how many lines would you use to block it in?

Drawing-Book, *page 19.* — Drill Exercise. Practice for Exercise XVII.

Practice. — Use this page for a drill exercise before drawing on page 20. Three ellipses differing in proportion are printed. Practice movement (see Fig. 6, page xiii) on the upper ellipse, moving in the order 1, 2, 3, 4. Repeat the movement half an inch to the right, and draw an ellipse with one sweep of the pencil. Repeat. Following the same order, draw two ellipses at the right of the second and third ellipse. *No erasing.*

(If much practice has already been given in ellipses, see Practice, page 37).

Directions, page 20. — Having arranged a group, obtain the proportion of the width to the height of the group by measurement on the pencil, as illustrated, page 66. Indicate by light verticals and horizontals the space to be occupied by the group, making it of a suitable size for the page and of the proper proportion. Block in first the group, then the principal object in the group, and then the others. Draw the table line, studying to place it well. *Do not erase or finish.*

EXERCISE XVIII. — Grouping.

From Objects.

OBJECT. To arrange a pleasing group containing a cylindric form; to study the appearance of the group; to draw the appearance.

The Group. — In the last exercise, a group was simply blocked in. In this exercise, the group is not only to be blocked in, but the drawing is to be completed. The group arranged for the last exercise may be drawn, or a new one may be arranged. The arrangement should be studied with reference to all the points suggested in the last exercise. Consider also the arrangement with reference to carrying the eye into the picture. Placing one object farther back than another suggests distance into the picture, which is always pleasing, as it brings with it the feeling of freedom. If one of the objects is placed so that its axis or its leading lines tend from you, it will aid in producing the effect of distance. The group being arranged, it should be blocked in, as in the last exercise.

Rendering. — Having blocked in the group, the next thought must be how to finish it so that it may best tell its story. In completing any drawing, it is necessary to have in mind the whole thought which is to be expressed. In this case, as it is the desire to show, not *single* objects, but a group of objects, the *rendering* — that is, the quality and variety of line used — should be such as to suggest the leading ideas of a group. Therefore, it should be the aim to express the same ideas in the drawing that were specially considered in the arrangement.

The Principal Object. — It is necessary that one object should be more noticeable than others, in order to have the eye at once attracted. The principal object in a picture may not be consciously observed first, but the eye finds there a resting-place; if, on the contrary, there are two or three objects equally prominent, the eye is distracted, and the attention wanders. The principal object should be rendered by drawing in such a way as to attract the eye at once. The lines should be not only the strongest in the group, but they should also be the most definite.

Secondary Objects. — One object alone is not so interesting as a group of objects. The introduction of other objects, though less important, adds the agreeable element of contrast by means of the relation of these objects to the principal object. As they are subordinate to the principal object, they should be rendered by lines not as strong and not as definite as those of the principal object.

Distance. — The effect of distance into the picture, obtained by the placing of some of the objects farther back than others, must be expressed in the rendering by

making the lines for the farther objects somewhat lighter and less definite than those of the principal and nearer objects.

Light and Shade. — A little emphasis on the side of the objects opposite the light, to suggest shadow, will also add to the effect. If the light comes from the left, — as it should do in every schoolroom, — the shadows of the objects would be on the right side, and hence the right side should be emphasized. But the light comes from above also, so that the lower part may also be strengthened. These dark lines suggest shadow, but they also suggest light; for there would be no shadow were it not for the light. So the touches for shadow really introduce the thought of light into the group.

Variety. — The element of variety will appear in the rendering already suggested. In addition, it must be remembered that the line should vary according to the character of the object. If the object is manufactured, the edges and profiles will be sharper and more even than those of a natural object. These qualities should be shown by an even and firm line in the one case, and by a varying line in the other.

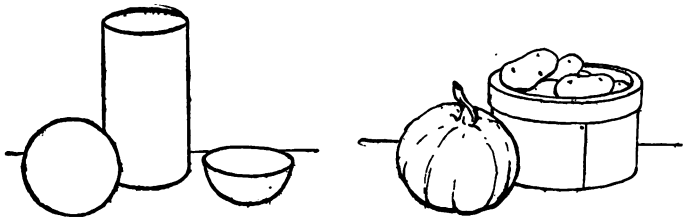
Unity. — The effect of unity produced by the arrangement of the objects can be increased in the rendering by putting the emphasis on the principal object, and keeping the others in their proper relation.

Repose. — This is one of the highest qualities in pictorial composition, but some of its elements may be brought out even in early work. The effect of repose produced by the proper and restful arrangement of objects will be increased in the rendering if the transitions from light to dark, from definite to indefinite, are gradual and not violent. The table-line is a very necessary, though minor, element of repose, as it gives the idea of support. The table-line should, however, be less prominent in drawing than the group.

In artistic rendering of outline, the principal and the secondary objects, the nearer and the farther objects, the light and the shade are all made manifest by the difference in quality and emphasis of line. The principal object has the strongest emphasis, and all other objects receive less in proportion to their importance in regard to the principal object. Thus the unity, the variety, and the repose that have been attained in the arrangement of the group are enhanced by the maintenance of the proper relations of the objects through the use of the varying quality and emphasis of line.

To be developed. — **Grouping; rendering; principal and secondary objects; effects of distance; light and shade.**

Suggestions for the Arrangement of a Group by Pupils. — What is the difference between a group and a row How can you get the effect of unity in your group? How can you get the effect of variety? Which object will you place first? How will you arrange the others?



The group of models given above may suggest an arrangement of objects similar in form.

Drawing-Book, *page 21.*— Drawing a Group of Objects.

Observation Exercise by Pupils. — How wide a margin should be left on this page? (*A margin of at least an inch should be left.*) Is the principal object in the group that you have arranged more at the right or at the left? Where is the highest part of the group? How can you express the general shape of the group? How few lines can you use?

Directions. — Having arranged a group, obtain the proportion of the width to the height of the group by measurement on the pencil, as illustrated on page 66. Indicate by light verticals and horizontals the space to be occupied by the group, making it of a suitable size for the page and of the proper proportion. Block in first the principal object in the group, and then the others. Draw the table-line, studying to place it well. Draw the curves over the blocking-in lines. Correct, erase wrong lines, and finish, studying to express by varying quality and emphasis of line the character of the objects and their relations.

EXERCISE XIX. — Study of the Bunchberry Leaf. — Unit of Design.

OBJECT. To study the shape of a leaf; to draw from it a unit of design.

The Motive of Design. — The motive of a design — that is, the form or shape which inspires it — may be geometric, historic, or from plant-form. In this exercise and the next, the motive is a plant-form, the dwarf cornel or bunchberry. As this is a wild flower, growing in the woods and not accessible to all, an illustration is given in the Drawing-Book that pupils may have an opportunity of studying it.

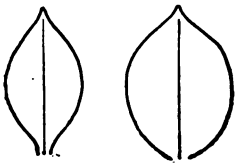
In some respects it is a curious plant. The flowers are very small, of a greenish color, and clustered in a head, the cluster being surrounded by a four-leaved white *involucre* looking like a white corolla. An involucre (derived from a word signifying to wrap around) is made up of a set of *bracts* surrounding a flower-cluster. Bracts, sometimes called the leaves of the flower-cluster, are generally very different from the ordinary leaves of the plant and are usually much smaller. As the flowers of the bunchberry pass away, bright red berries take their places. The berries are in a very close cluster, hence the name bunchberry. The plant is very cheerful, whether in blossom or with the berries. The illustration in the Drawing-Book shows the difference in shape and proportion between the leaves of the involucre and the leaves of the plant lower down on the stem.

Unit of Design. — In this exercise only units of design are to be drawn. The shape of these units is to be taken, one from the leaves of the involucre of the bunchberry, the other from the leaves of the plant. The shape of these leaves should be carefully studied; the different leaves of the involucre should be compared with each other, so that the general character may be obtained; the leaves of the plant should also be compared with each other. The leaves of the involucre should be contrasted with the leaves of the plant. The varying curves and their subtile beauty should be most carefully studied. When the eye and the mind are thus well filled with the shape of each, the units can be readily drawn. They should be drawn without modification of the natural leaves, except that they should be made symmetric for the purpose of this lesson — the left and the right half being made to correspond. They should represent, as far as possible, the ideal and not the accidental leaf.

As this study of the leaves is for the direct purpose of using their shapes as units in design, no effect of light and shade should be given in the drawing. The midrib and veins should be omitted. Each unit should be left open at the bottom to express growth.

To be developed. — Observation of leaves; shape, proportion; motives of design; quality of line.

Suggestions for Study by Pupils. — Turn to Drawing-Book, page 23. What do you see? (*I see a four-petaled flower.*) It looks very much like a four-petaled flower, but it is not. There is a cluster of small flowers in the centre and the four petals are really the four leaves of the involucre which surrounds the flower-cluster. What is the difference in shape between the leaves of the involucre and the leaves of the plant below? Study the difference carefully.



Drawing-Book, page 22, completed.

Drawing-Book, *page 22.* — Drawing two Units.

Observation Exercise for Pupils. — What do you find upon the page? For what purpose are the verticals? What are you to do upon the page?

Directions. — Two verticals are printed as the axes of two units. On the first draw, from the leaf of the plant, a unit open at the base; on the second draw, from the leaf of the involucre, a unit open at the base.

EXERCISE XX. — Decorative Design from the Bunchberry.

OBJECT. To draw a design for a rosette, using a plant-form as a motive.

The Rosette. — The design required is a rosette, having as the enclosing figure a square on its diagonals, the motive for the design to be taken from the bunchberry. Draw on the board two lines, a horizontal and a vertical, two feet long, crossing each other in the centre. Connect the ends of these lines by straight lines, drawing them by opposites. The figure is a square on its corner, the horizontal and vertical being its diagonals. As in drawing a square on its corner the diagonals are drawn first, it is also called a **square on its diagonals.**

Repetition about a centre is seen in the natural growth of this plant. The leaves or bracts of the involucre are arranged in a whorl or ring of four about the main stem. A square rosette is suggested by the involucre, therefore this plant is well adapted for use here.

Field of a Unit. — The space in which a unit is to be used is called the *field.* In designing any decorative arrangement it is essential to adapt or select the unit with relation to the field. See page 56.

To be developed. — Plan of the rosette; ground, field; proper filling of space; simplicity, contrast, stability; repose; quality of line.

Suggestions for Study for the Unit. — (In the study for the unit, the teacher should endeavor to lead the pupils to the following conclusions, by asking for opinions and reasons.)

This rosette should have but four units. The number of units in any arrangement about a centre should always be either equal to or a multiple of the number of sides of the enclosing figure. For the sake of simplicity (a very great beauty in decorative design, as it generally adds to the effect of repose) the smallest number of units is generally chosen.

The units of this rosette should be placed vertically and horizontally; if placed obliquely, the **ground** of the design would not be well filled. The rosette should occupy about two-thirds of the ground.

The **field** of each unit should be considered, in order to determine the shape and proportion of the unit. In this case, by drawing the diameters of the square on the board, the fields for the units are shown to be squares on their diagonals. As the field of the unit is a square, the unit should be rather wide in proportion to its height.

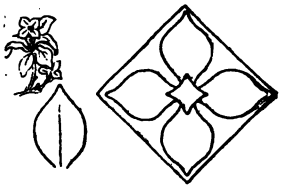
Drawing-Book, *page 23.* — Drawing the Rosette.

Suggestions for Study for the Design. — (The teacher should lead the pupils to look for the whole effect as to proper filling of the space, as to **simplicity**, as to adherence to the motive, as to beauty of curvature, as to **contrast** and variety by proper balanc-

ing of curved and straight, rounded and angular, as to **stability** by union at the centre, as to harmony by the agreement of the parts, and as to **repose** by the union of all these qualities.)

Drawing. — Draw a square on its diagonals in the space at the right, using the points given as the ends of the vertical diagonal. Add the diameters to make the fields for the units. Study the upper field; draw on the vertical printed under the illustration a unit from that leaf in the illustration that you think best fitted to fill the field. In drawing this unit, think not only of the beauty of curvature, but also of the character of curvature that seems to belong to the plant.

Draw four such units around the centre of the square, drawing them by opposites. Study the effect of the units and consider whether by changing the shape and proportion slightly, the effect would be improved. Remember that too many sharp points make an unpleasant figure, — that where the enclosing figure has a pointed effect, it is very seldom desirable that the unit should be of such a shape as to add to that effect.



Drawing-Book, page 9, completed.

Decide on and draw a central figure of suitable size to give the effect of stability; add to the harmony of the design by making the central figure either a circle or a figure having the same number of sides as the enclosing figure; add to the variety in the figure by making the central figure different in outline from that of the enclosing figure. Change the design where the effect seems to require it. Erase construction lines and finish in even, gray lines.

OPTIONAL EXERCISE.

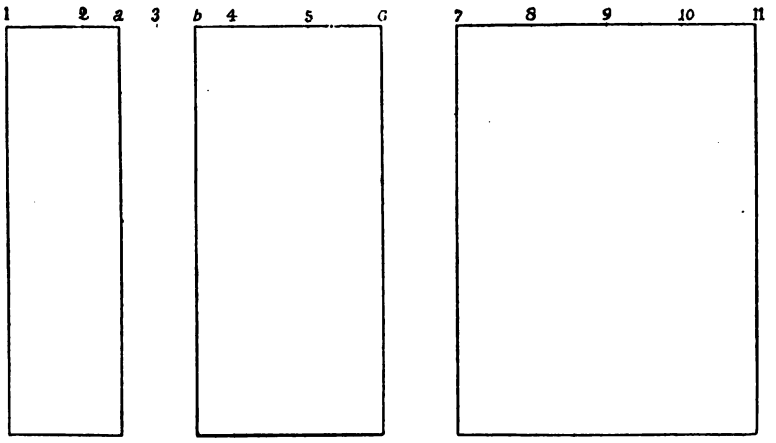
THE last page in the Drawing-Book may be used for an exercise on any part of the work in the book in which the teacher may think the pupils need further practice, or it may be given to an exercise in color.

Color. — If these are to be Color as well as Dimension Exercises, the relative values of the Primary pigment colors should be recalled, — yellow 3, red 5, blue 8. The purpose is not so much to keep before the pupils the numerical ratio of the color values as to fix in their minds that in order to produce a harmonious and satisfactory result in the use of these three colors in composition (unless working to a particular scale of color), there should be less yellow than red, and less red than blue. To continue this impression, the relative values of the colors are adhered to in this exercise.

Teachers should be prepared with oblongs six by nine inches of normal yellow, red, blue, orange, green, violet, citrine, russet, olive, to be pinned up on the board in three groups.

Graded Washes. — In the Color Exercises in previous books, the colors have been learned in laying on **flat washes.** In the exercises for this book, **graded washes** are introduced. In making a graded wash, work should be begun at the top with a brush full of wet color; more water should then be taken in the brush, to float the color down in gradually decreasing strength, and this should be repeated, thus making a wash graded from full down to pale color. The surface on which the work is done should slant a little.

Oblongs can be drawn as illustrated below and as dictated on page 140. The



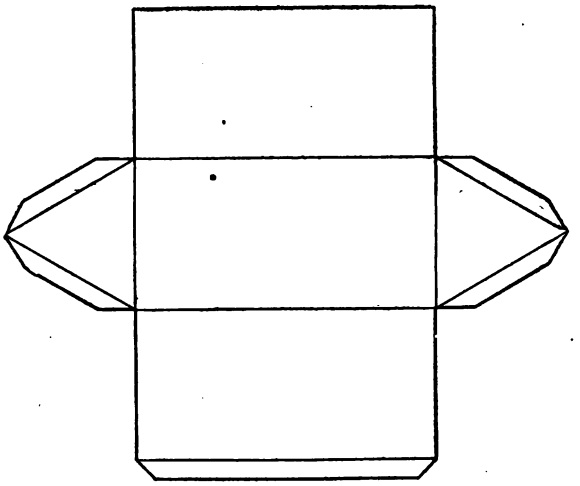
first oblong can be colored with a graded wash of yellow; the second, with a graded wash of red; the third, with a graded wash of blue.

Observation Exercises for Pupils. — I have here nine colored oblongs in three groups. Who will tell me the colors of the first group? Who will tell me the colors of the second group and how they may be made? Who will tell me the colors of the third group and how they may be made?

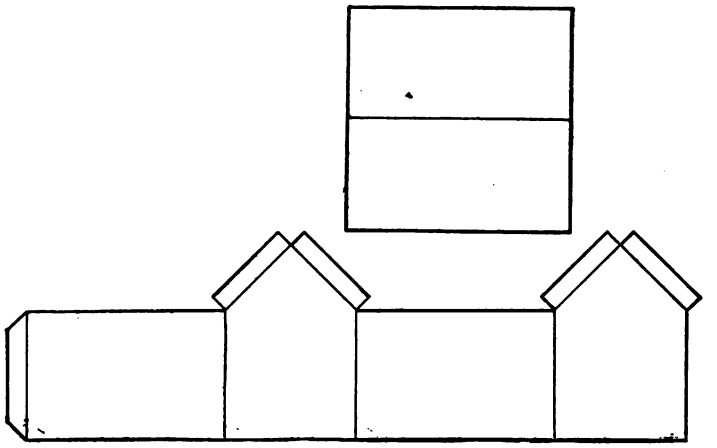
Directions. — Bisect the upper edge of the page, and an inch below the point of bisection place a point, thus dividing the page. Bisect each half, thus making four parts. Trisect each part. Mark each point of trisection. Are the spaces longer or shorter than inches? (*They are shorter than inches.*) Number these points, beginning at the left, 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11 Bisect the distances between 2 and 3 and between 3 and 4, and letter these points *a* and *b*. From points 1, *a*, *b*, 6, 7, and 11 draw verticals to within half an inch of the lower edge of the page. Draw horizontals from 1 to *a*, and from *b* to 6, and from 7 to 11. Complete the oblongs by drawing the lower horizontals. Color with graded washes the narrowest oblong yellow, the next one red, and the last blue. If paints cannot be used these directions can be carried out by the use of colored papers, using a normal and two tints for each color.

PATTERN SHEETS.

Prang's Pattern Sheet No. 8. Equilateral Triangular Prism.



Prang's Pattern Sheet No. 9, Toy House.



Illustrations are given here of the pattern sheets which accompany Book IV.

From Pattern Sheet No. 8, an equilateral triangular prism is made to be used in Exercises II. and VII.

From Pattern Sheet No. 9, a toy house is made to be used in Exercise XVI.

FORM STUDY AND DRAWING IN OTHER STUDIES.

THERE is a growing feeling for the importance of Form Study and Drawing as reaching beyond their own domain, and as being so closely connected with all that is about us that they should be used constantly in connection with other studies. To Geography, Number, and Language they bring new life; and teachers are seeking ways of adapting them to these studies as well as to Science, to Manual Training, and to History.*

Language. — Throughout the regular form and drawing work, as laid out in Drawing-Book IV. and this Manual, teachers should continue to give pupils practice in the use of terms and names learned in the previous form study, as well as in the use of those given below, always requiring complete sentences.

Names of Models, Objects, and Details.

ELLIPSOID, OVOID, EQUI. TRI. PRISM.
ELLIPSE, OVAL; long diameter, short diameter.
TRIANGLE; equilateral, right-angled; vertex, altitude, base.
CIRCLE; radius, radii, circumference.
FLOWER; corolla, calyx, petals.
COLOR; olive or purple-green; russet or orange-purple; citrine or orange-green.

Terms of Construction.

FACTS; foreshortening of faces and edges.

Terms of Representation.

APPEARANCE; apparent convergence of edges; foreshortening of faces and edges.
OBJECT; selection, rendering.
GROUPING; distance, light and shade.

Terms of Decoration.

ORNAMENT; saracenic.
UNITS; their modification in outline, and in proportion.
BEAUTY; arrangement, proportion, shape, grace of curves.
NATURE; plan, motives.
ROSETTE; ground, filling of space; simplicity, contrast, stability.

* There is now in preparation a series of handbooks showing how Form Study and Drawing will lift and lighten the whole school-work if introduced into other studies at the same time that they are systematically pursued as special subjects of study and training.

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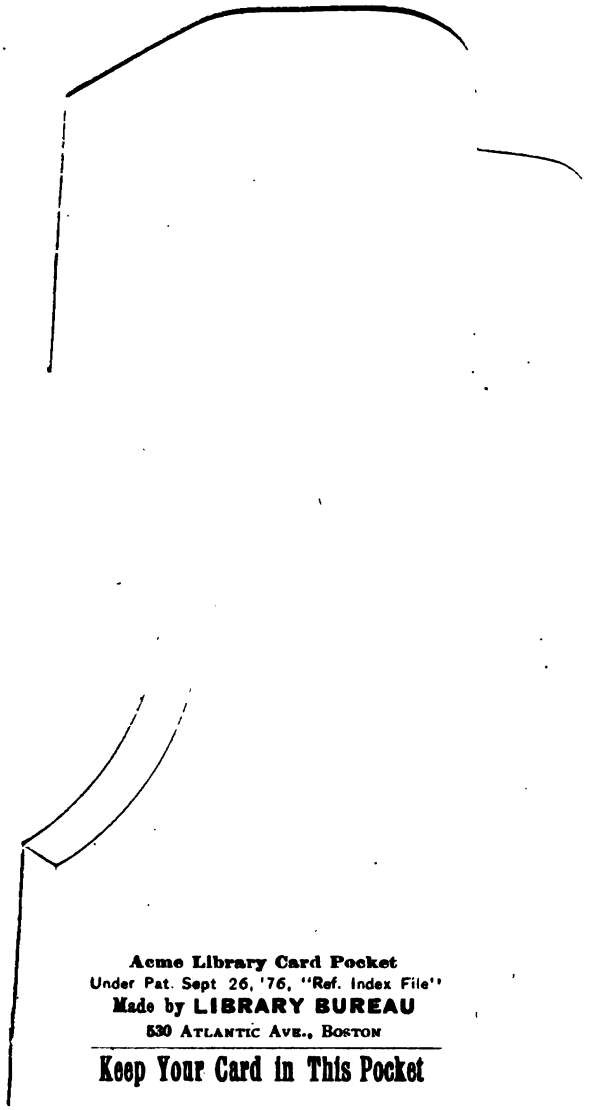

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